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EDITORIAL NOTES.

The Coal Strike and Gaslight Results.

HAVING in view the facts that the Gaslight and Coke Company are the largest individual consumers of coal in the gas industry, and that the past half year included the great coal strike, there will be more than normal interest in considering the financial and working statements that the Board have circulated among the proprietors. The accounts disclose a strong financial position, and an undertaking with large inherent strength; and this at the close of a half year that has done more than any period now for many long years to test the capabilities of the concern and of its men—high and low in status. It will not be a difficult matter for those who have taken part in the administrative and executive work of the Company in the past half year to bear in mind that the anxieties of that time were coincident with the period in which the centenary of the undertaking was celebrated. On this event the Governor (Mr. Corbet Woodall) and his colleagues, the staff, and all workers generally in the Company, have already had congratulation showered upon them; and now upon the result of the working of a half year in which there have been extraordinary opposing forces they are also very heartily felicitated. The cause for congratulation is not found in the profit-balance (after meeting all fixed charges and other items) of £428,028, which, as a matter of fact (although the half year includes for the first time the proceeds of the business in the defunct Barking and Chigwell Companies' areas) is somewhat short of the profit-balance of the Gaslight and Coke Company alone in the first half of 1911. We are giving up profit-balances as any sufficient test of the financial position of a Gas Company after a period's working. Accounts have to be examined part by part and item by item before the real position is revealed; and having examined the present accounts by this process, it is sufficient to say that we are genuinely and pleasantly surprised that the Company have issued from this black half year—black in regard to coal and labour troubles—with an improved position. A lower price of gas, a drop in the receipts for coke (probably owing to the less quantity of coal carbonized), a large addition to the charges under the head of distribution, and retiring allowances under the 1911 Amalgamation Act, go to explain why the profit-balance is less. However, the increased charges under the head of distribution which go to make for financial stability, are aspects of the accounts that are welcomed; the other matters that affect the profit-balance are of temporary concern.

Wherever one looks in the accounts, there are the visible signs of added strength, from the capital account, through the working statements, to the reserves. The Company will need a good round sum at their back as an assurance in the immediate future. They will have it in the £768,407 undivided balance which will remain after paying the increased dividend—increased by 2s. 8d. per cent.—at the rate of £4 17s. 4d. With this substantial undivided balance, the statement in the report that the price of coal has increased materially since the last contracts were made, and consequently those for the current year will show a considerable advance, need not, and will not, cause such solicitude as it might otherwise do. The reference to coal leads to a point that arouses interest in the present accounts. It is one of the finest tracks that the coal strike could have left upon the accounts; and it illustrates the important part that the manufacturing department must play in pulling through a half year, and a time such as that experienced during the six weeks' strike and after. Let us remark, before giving figures, that the accounts of the Barking and Chigwell Gas Companies for the first half of 1911 have been amalgamated with those of the Gaslight and Coke Company in getting out the figures for comparison with the past half year. So dealing with the accounts, coal in the past six months shows a diminished cost of £74,494; but oil cost £57,073, or £11,448 more, and coke and breeze used in manufacture £53,039, or £8995 more. The net decrease in the cost of material for gas manufacture is £54,051, which is a helpful sum. But we see that the Company's consumption of coal in the half year was down to 881,654 tons, which is 62,926 tons less than the Gaslight and Coke Company used in the corresponding half year, before the Barking and Chigwell supplies came into reckoning. This is interesting; but the reduction in the quantity of coal is not alone accounted for by the increased quantity of carburetted water gas made. In all, 8,475,280 gallons of oil were consumed, which is an increase of 2,010,845 gallons upon the amount the Gaslight Company used in the first half of 1911. The quantity of water gas made was 3,456,285,000 cubic feet, or an increase of 474,406,000 cubic feet on the Gaslight figure in the June half of last year. Now, if we deduct the former of the last two figures from the quantity of gas made in the past half year (14,566,457,000 cubic feet), there remains a make of coal gas of 11,110,172,000 cubic feet; and if we divide this by the 881,654 tons of coal carbonized, there is found a make per ton of no less than 12,600 cubic feet, upon which, if we mistake not, the Governor will be able to congratulate the Chief Engineer (Mr. Thomas Goulden), the Works Engineers, and the carbonizing men as being the record production in the Company's history. Six months ago, we pointed to a slight backward movement in the make of gas per ton; but the 12,600 cubic feet of the past half year is 674 cubic feet per ton in excess of the Gaslight production of the first half of 1911. This increase, multiplied by the 881,654 tons of coal used, represents in additional gas yield 594,234,796 cubic feet, which, if we regard every 12,600 cubic feet as equal to a ton of coal, represents about 47,162 tons. This is a considerable contribution to the lessened cost of coal, and accounts for a substantial part of the smaller quantity required; the additional make of carburetted water gas accounts for the balance of the reduction in the quantity of coal carbonized.

There is another interesting point about the additional make from the quantity of coal used, and it is that it is more than double the increase in the sales of gas in the half year. The report mentions 1·94 per cent.; the volume of gas sold exhibits an increase of 254,982,000 cubic feet, all of which is private consumption, except an extra 12,497,000 cubic feet under public lights and contracts. Though there was this excellent increase in the half year, in which opposing business factors operated—for instance, the demand during the coal strike and the probable reduction during the sultry weather towards the end of the period covered by the accounts—the receipts for gas show a falling-off. Including public lighting, the revenue from gas was £1,664,890, which was £25,795 less than in the first half of 1911. Be it remembered, however, that the price in the Gaslight area was 1d. per 1000 cubic feet less than in the corresponding period of last year, and in the Barking and Chigwell areas there were also reductions. Seeing that on the half-year's private consumption an average 1d. per 1000 cubic feet reduction would mean about £54,000, the result is excellent. Following on with an examination of the revenue, the rental of meters, stoves, and fittings has increased by £19,809; and it may be incidentally remarked that the number of consumers has been augmented by 10,279, and gas-stoves by 24,451. In view of the fact that the half year was not the gas-fire season, in which such excellent business has been done of recent years, the 24,451 stoves show that the coal strike was an ill-wind that blew someone good. The income from residuals was £524,671, which was a reduction of £8649. But coke returned £14,456 less, and ammoniacal liquor and sulphate of ammonia £986 less; while breeze produced £1939 more, and tar and tar products £4853 more. The explanation of the reduction no doubt lies in the reduced quantity of coal carbonized. The half-year's receipts were £2,372,159, or less by £14,185 than in the first half of 1911.

On the opposite side of the revenue account there is a total

reduction of £64,021 in the manufacturing expenses. Raw materials, as we have already shown, are a firm contributor of £54,051 to this, under the circumstances explained. Repairs and maintenance of works, too, cost £20,712 less; but there are gains in other items. For instance, we see the full effect of last year's increase in the carbonizing wages—an additional £5000 or so having been required for this purpose. The manufacturing results show the sum has been earned. The total distribution expenses amount to £357,363, or an advance of £43,184, made up of increases in every item—salaries and wages, repairs and maintenance of mains and services, and repair and renewal of meters, stoves, and fittings. But if the capital account is looked into, it is seen that £56,814 has been written off for the depreciation of meters and stoves, as well as £15,582 for the depreciation of plant. Some £2000 additional has been spent on the public lamps. Rates and taxes are about £6000 more; and among other items there is a charge of £15,924 for retiring allowances under the Act of 1911. The total expenditure is £1,695,870, or an increase of £9725. Adding this to the £14,185 less revenue, the difference of £23,910 is obtained, by which the amount (£676,288) transferred to the net revenue account is less than the balance twelve months since. As we said at the beginning of this review, the account is a strong one, due to administration, management, and hearty co-operation by all ranks of the Company; and it shows, in marked manner, the wonderful vitality of the concern.

The Fouling and Revivification of Oxide.

The Chief Inspector of Alkali Works (Mr. W. S. Curphey), in the course of his annual report (from which abstracts were given in the "Journal" last week, and are concluded to-day), refers to the researches which have been made from time to time on the fouling and revivification of oxide of iron. These researches have thrown light on the action of oxide as a gas-purifying material, and have helped to settle the conditions in which it may be used to the best advantage. But it is indisputable that there is scope for further research on the question, and that more exact knowledge than is now possessed regarding the effects of temperature, humidity, and the presence or absence of air on the activity of oxide in purifiers would be of great service to the gas manager. On a cognate use of oxide—viz., for the absorption of the sulphuretted hydrogen contained in the crude gases from the saturators of sulphate of ammonia plant—Mr. Curphey has carried out, with the aid of his Assistant (Mr. Linder), a series of valuable investigations, of which the primary object has been to ascertain the cause of the "souring" of oxide which sometimes occurs. This "sour-"ing" is a condition assumed by the oxide after use, which is characterized by extreme sluggishness or inactivity in respect of both the absorption of sulphuretted hydrogen and oxidation or revivification. The investigations go far towards revealing the conditions in which oxide becomes "sour," and incidentally throw much light on the effects of temperature, humidity, and aëration on the fouling and revivification of oxide. The account of them, which is given in other columns of to-day's "Journal," will well repay most careful study by all who are interested in the purification by oxide of either coal gas or the effluent gases from sulphate saturators.

It would appear that, given absence of oxygen, the proportion and nature of the other gases which accompany the sulphuretted hydrogen into the purifier do not materially affect the absorption of that gas by the oxide. In crude coal gas the sulphuretted hydrogen will be only 1 to 1·5 per cent. of the total volume; whereas in saturator gases, it may range from 10 to 45 per cent. The remainder of these gases will be almost wholly carbonic acid. Notwithstanding such differences in composition, it would seem that, *ceteris paribus*, oxide is equally active in both cases towards sulphuretted hydrogen, provided the rate of flow, calculated for that constituent, is the same, and provided that any air admitted is proportional in volume to the sulphuretted hydrogen present. Consequently, most of the information afforded by Mr. Curphey's investigations is directly transferable to the use of oxide in gas purification.

The conclusions to which the results of Mr. Curphey's experiments point may be summarized as follows: The temperature most favourable for maximum absorption of sulphuretted hydrogen, either with or without admission of air with the gas, lies in the neighbourhood of 140° Fahr. Oxide fouled at about this temperature gives, on revivification, a maximum yield of free sulphur, and a minimum of sulphur in other forms. The efficiency of the oxide as an absorbent of sulphuretted hydrogen is controlled in a marked degree by the amount of moisture present, and wetting the oxide, and then drying at about 77° Fahr., appears to give about the most efficient degree of hydration. The admission of air with the gas, in the ratio of two volumes of air to one volume of sulphuretted hydrogen, increases the efficiency of the oxide, both in respect of the weight of sulphur which it absorbs and the yield of free sulphur therefrom. The fouling of oxide at temperatures above about 210° Fahr., in the absence of air, and above about 275° Fahr. when air is admitted, results in the formation of soluble salts of iron (*e.g.* the sulphate), and of the disulphide (FeS_2) in very considerable quantity. The condition of "sourness" is thus produced, and the efficiency of the oxide is interfered with. On exposure to air, the disulphide is oxidized by degrees to ferrous sulphate; and, if treated with alkali, the latter is converted into ferrous hydrate, and ultimately into hydrated ferric oxide. Thus, by alternately treating it with alkali and exposing it to air, "sour" oxide may, after awhile, be restored to a healthy condition. The presence of a trace of ammonia in the gas may possibly prevent the formation of the disulphide, and the incidence of "sourness." The formation of ferrous sulphate is hindered by the presence of air, with sulphuretted hydrogen in excess, even when the temperature is high.

These are the more important deductions to which the experimental work leads. An attempt has been made also to compare the conditions prevailing at a number of works where oxide is used for absorbing the sulphuretted hydrogen from the saturator gases from the sulphate plant—some being works where "souring" of the oxide is rare, and some being works where it is chronic. But the comparison has proved fruitless, by reason of the insufficiency of the information available on many material points. Hence the deductions from the laboratory researches have not yet been substantiated by the results of observations made on works' purifiers. Some useful data, however, as to the temperatures prevailing in the oxide purifiers attached to the sulphate plant at the Dundee Gas-Works have been supplied by Mr. Alexander Yuill, the Engineer and Manager of the works, and some less complete observations have been made by Mr. Linder on the similar purifiers at the New Southgate Gas-Works. These data are included in Mr. Curphey's report, which also gives a valuable historical *résumé* of the work of earlier observers on the behaviour of oxide in the removal of sulphuretted hydrogen from crude coal gas.

Sulphate of Ammonia Production.

The annual report of the Chief Inspector under the Alkali Works Regulation Act (Mr. W. S. Curphey) is, like those of his predecessor (Mr. R. Forbes Carpenter), one for study. These documents are not a mere record of the extent of formal duty performed, and of the results of inspection; but the Chief Inspector and those who labour with him are so enthusiastic over their work that they investigate processes and problems, and try to discover the *raison d'être* of certain phenomena that are met with in the course of their examinations. Such work as this is of the greatest possible help to those whose business it is to conduct the processes. In the present report, there is an account of much laboratory and other investigation; and it is hoped that Mr. Curphey and his colleagues will have an opportunity of further pursuing the particular subject now being dealt with, and of arriving at a definite conclusion. The inquiry that they have taken up is discussed in the preceding article.

Here, however, two or three other interesting matters may have attention drawn to them. The first is as to the distribution of the production of sulphate of ammonia. It will be observed that the figures given by the Chief Inspector as to production during 1911 vary somewhat from the estimates supplied by Messrs. Bradbury and Hirsch at the beginning of the year, but not to any substantial extent—indeed, the approximation of the two sets of figures is surprising. But in Mr. Curphey's figures, he separates the coke-oven output from that of producer gas plants and carbonizing works; so that we obtain here the exact relation of the contribution of coke-ovens to that of gas-works. The figures show that the rate of increase from coke-ovens is proceeding at accelerated pace, which, if sustained, will, in the course of five years,

place the production of this active source abreast of that of gas undertakings. A spoke may this year have been put into the wheel of progress by the length of the coal strike; and we shall see to what extent, if any, later on. The increase, however, from this source in 1910 upon 1909 was 9779 tons; while last year the advance on 1910 was 12,678 tons—bringing up the production to 105,343 tons, which is only 63,440 tons behind the total output of gas-works (168,783 tons), which output expanded by some 963 tons in the year. In view of the expansion of the gas business of the United Kingdom, the small increment of sulphate of ammonia output may appear somewhat inexplicable to the outside observer. It is, however, sufficiently explained by the increase in gas business having been largely met, not by any large additional consumption of coal, but by the material gains in gas production per ton of coal, owing to the application of more scientific methods in carbonization. The last two or three years, too, have shown an increased use of water gas, which also means a certain amount of restriction in the rate of advance of the carbonization of coal for gas production.

Looking in other directions, it is observed that producer and carbonizing works, with a production of close upon 30,000 tons of sulphate of ammonia, extended their girth by upwards of 2000 tons; while shale-works, in their yield of 60,765 tons, added 1652 tons to their disposable quantity. Iron works continue a steady contribution of about 20,000 tons. The sum of the increased output of 1911 upon 1910 is 17,389 tons; and it speaks well for the position in the markets that sulphate of ammonia has created for itself that current prices, in view of the constantly expanding output, should be maintained at the figures that have been realized for some time past now. The fact of increasing supply cannot be altered; and no one wishes to alter it. There is plenty of room for the creation of additional demand; and that is the work that has to be followed up with true commercial persistence.

Mr. Curphey refers to the slow departure from the old system of producing sulphate of ammonia to the "direct" one. This change is one that must wait on experience, and on the proofs of an economic advantage. But it is quite possible that, by the aid of the work of the Alkali Manufacturers' Association, a large number of the smaller gas-works will be driven to the adoption of sulphate of ammonia manufacture by utilizing one of the simple forms of plant now on the market. If this is one result of the impasse the chemical manufacturers are trying to create, for their own benefit, in regard to ammoniacal liquor, then the Chief Inspector and his fellow workers will find their peregrinations amid rural scenes will be on the increase.

Grandmotherly Prescription.

We shall begin to doubt the wisdom of having Public Service Commissions, as is the case in the United States of America, when we find them decreeing conditions to apply to the public services that are both useless and (we were going to say) impracticable, but anyway that are partly that, and wholly burdensome. In this country there has been in the Parliamentary Committee rooms this session, an attempt to raise the old statutory minimum pressures for gas supply; but Parliament has not been persuaded that there is any need to interfere, in view of the necessity that exists for gas suppliers to do what is essential in these times in this respect for their own protection, and to safeguard the continuity of patronage. These conditions are quite sufficient. Nothing can improve upon them; but, on the contrary, it is easy to see that cast-iron rules as to pressure, and as to infinitesimal pressure variations, may work to the detriment, instead of serving the interests, of consumers in each district. Gas-supply districts must be of wonderfully uniform level, and the conditions of gas use must be particularly constant that will be able to comply with certain of the rules that the Public Service Commission of the First New York district have laid down regarding supply pressures in the borough of Manhattan.

Pressure-gauges are to be fixed at the minimum pressure point in each square mile of gas-supply area; and no consumer is to be beyond a defined maximum distance from a pressure-gauge. The consumers we do not suppose will ever realize anything different from what exists now, though they have so close at hand these silent detectors watching over their interests. Indeed, we imagine that every gas engineer responsible for a good service in his area of supply would habitually investigate the pressure conditions without such a stipulation as this. Another condition is that the minimum pressure is not to be less at any time than 2 inches on two consecutive days, as measured at the consumers' end of the service-pipe; and the maximum pressure, unless there is a specific formal request for anything higher, is not to be more than 6 inches. The Commissioners are going to the extremes of absurdity. There is really no need for 2 inches pressure when consumption is not proceeding—say, during the night; and there is no necessity to limit the top pressure to 6 inches, seeing that it all depends upon the use to which gas is to be applied what is the most suitable maximum. Inverted burners, gas-fires, gas-engines, and other uses compel the gas suppliers to keep the minimum right; and the consumer gets the best possible pressure for his individual requirements when the gas suppliers maintain, during the hours of consumption, a high pressure on the district, and govern it down to what is necessary on the consumer's service-pipe. If there are substantial arguments against such a minimum at all times as 2 inches and a maximum of 6 inches, one can really only ridicule the stipulations as to maximum momentary pressure variations and maximum pulsating pressure variations.

The Commissioners are working for impracticable conditions; while competition, self-protection, and the complaints of consumers in the event of seriously defective pressures, are much more effective to the gaining and maintaining of the desired end than stereotyped minimum and maximum figures, with other conditions sandwiched between. Gas supply in this country has had enough of grandmotherly prescription. The Public Service Commissioners of the First New York District might have kept themselves free from going to a worse length (as will be seen by the report elsewhere in this issue) than has ever been suggested here in England.

County Borough of Stoke-on-Trent Gas Supply.

Some particulars will be found in another part of this issue of the past year's operations of the four gas-works comprised in the area of the County Borough of Stoke-on-Trent—namely, Burslem, Fenton, Longton, and Stoke—and it is shown that there was a total increase in consumption for the twelve months of 22 million cubic feet. Under the provisions of the Federation Act of the County Borough, the Corporation are not allowed to make profits in aid of the rates, and consequently the price of gas has been materially reduced. As a matter of fact, the price charged during the year was 1s. 10d. per 1000 cubic feet (with reduced rates for motive power and public lighting, and no meter-rents), with the exception of the Stoke works, whose rate was 3d. more, or 2s. 1d. per 1000 feet. The Gas Committee, however, are striving to give consumers at Stoke the same benefits as are enjoyed by the other towns. It may be mentioned that a feature of the policy adopted by the Council is to charge the same price per 1000 cubic feet to the slot-meter consumers as to users of ordinary meters. The accounts show that the loan repayments and interest in connection with the different works amounted, per 1000 cubic feet of gas sold, to 6·25d. at Burslem, 6·94d. at Fenton, 9·32d. at Longton, and 6·36d. at Stoke. At three of the works there was a profit on the year's operations; the figures being Burslem 1·55d., Fenton 2·74d., Longton 2·87d. per 1000 cubic feet sold. The remaining works—Stoke—on the other hand, shows a small loss of 0·31d. per 1000 cubic feet of gas sold. The working statistics show that Longton came first in the matter of the make and sales of gas per ton of coal carbonized, while it was at the bottom of the list as regarded the percentage of gas unaccounted for. The make of gas per ton of coal at Longton was 13,080 cubic feet, and the sales 12,230 cubic feet; while the proportion of gas unaccounted for was 4·72 per cent.

Public Lighting of the City of London.

The annual report of the City Engineer, Mr. Frank Sumner, M.Inst.C.E., on the lighting of the City of London, is, as usual, extremely interesting. It deals fully with the question of the rival illuminants in the City—bringing down to date the story of the struggle that has taken place during the last few years between the Companies concerned. The report enumerates the stages that have led to the present decision, mentioning the visit of the deputation to the Continent in 1909, the subsequent experiments of the Companies in 1910, and the arrangements afterwards made

by which the Companies agreed with the Corporation to divide the City in equal proportions between them for lighting by gas and electricity, by centrally-hung lamps as far as practicable, thus saving to the ratepayers about £6830 per annum—viz.. gas about £3380, and electricity about £3450—in the cost of lighting, and at the same time giving the Corporation an increase in illuminating power of some 600,000 candles, on a ten years' contract. The present cost of public lighting in the City, as set out, is about £20,873. From the report, it seems there are still 332 "original type 'open' arc" lamps in use, for which the Corporation pay £26 a year each, against 71 flame arcs of considerably greater candle power, for which only £17 10s. each per annum is paid. We presume, however, that these old, expensive, and not very efficient lamps are all doomed under the new contract. If otherwise, there would be no justification for their continued existence. We notice that 80 failures of arc lamps cost the Electric Lighting Company £13 2s. 7d. during the year in penalties, and that the lighting of the electric lamps during 43 foggy occasions cost the City £330 17s. 3d. Turning to gas lighting, we find there were 2648 lamps of various types, of which 130 are high-pressure lamps in the main streets. The lighting up of these 2648 gas-lamps during 54 foggy days entailed an additional cost of £404 9s. 7d. Dealing with the high-pressure lamps, it is pointed out that those in Fleet Street "have been satisfactorily maintained during the year." A list of the thoroughfares to be lighted by centrally-hung lamps, both gas and electric, is appended to the report, the lighting section of which concludes by stating that the experimental flame arc lamps (centrally hung) installed by the Charing Cross, West End, and City Electricity Supply Company during November, 1907, were taken over by the City of London Electric Light Company, which Company are now maintaining the lamps Thus exit the Charing Cross Company from City public lighting.

Hygienic Efficiency of Gas-Fires.

Up to the present, there has been no generally recognized standard test in the gas-supply industry for the hygienic efficiency of gas-fires. In the works of some of the manufacturers chemical tests are made, under certain conditions, but what these conditions are is a matter about which the outer world knows little, if anything. Outside the makers' works, frequently a lighted taper held in front of the canopy of a fixed gas-fire has given satisfaction to the fitter; and the experience of consumers has satisfied them as to the presence or otherwise in a room of vagrant products of combustion. The Davis Gas-Stove Company, as will be seen in an article elsewhere in this issue, has proposed a new standard of hygienic efficiency, which gives assurance that those gas-fires that can comply with it will be, in themselves, positively efficient from the hygienic standpoint. Their technical staff has devised what is termed the "Shadowgraph" test for gas-fires, the details of which test will be found described in the special article. The standard of efficiency put plainly is this: That, without the aid of chimney draught or any addition to the fire in the way of flue-pipe, there shall be no escape whatever, as certified by the test, of products of combustion from beneath the canopy of the fire. There are fires on the market that could not meet this standard of efficiency, but from which, with the aid of chimney draught and a length of flue-pipe sufficient to produce the necessary draw, no products are found to escape from the canopy into a room. But the Davis Gas-Stove Company maintain that, if the canopies, the canopy chambers, and the flue openings of fires are properly constructed, and the relations of canopy to burner-line and of the bottom of the canopy to flue-opening are properly determined, there is no reason why every gas-fire placed on the market should not meet with the standard of hygienic efficiency which they have set up, and which their own new gas-fire productions show is obtainable. If this high efficiency can be attained by a fire (as demonstration shows it can be obtained) without the assistance of chimney and flue-pipe, then between such a fire and one that needs a flue to obviate escape of products under the canopy, there is a margin of advantage, to the credit of the former, that has a value to both gas supplier and gas user. That is a plain, incontrovertible submission. The points of construction in the canopy and associated with the flue-opening which the Davis Company contend, from the investigations of their technical staff, must be abandoned, and those which must be adopted to reach their standard, are set out in the article, and are illustrated by diagrams, in which are amalgamated what are considered at Luton to be incorrect and correct structural principles.

PRESENTATION TO MR. CORBET WOODALL.

THE Horseferry Road offices of the Gaslight and Coke Company were, last Thursday afternoon, the scene of an interesting incident in the celebration of the centenary of the Company. It was the presentation, by the staff of the Company to the Governor (Mr. Corbet Woodall) of his portrait in oils. In these introductory lines, it is unnecessary to explain the circumstances of the gift, which will be allotted a place of honour in the Board-room among portraits of those gas administrators who have a distinguished place in the annals of the Company for the part they have taken in making its unique history. The staff were present on the occasion in their hundreds; and most of them wore the centenary medal which was so conspicuous at the remarkable festival recently held at the Crystal Palace.

The presentation took place in the large dining-hall; and when the Governor entered, escorted by the Deputy-Governor (Mr. Ulick J. Burke) and other members of the Board, together with the chief officers, he was received by the large company with an enthusiasm, which alone testified a deep-rooted affection.

The DEPUTY-GOVERNOR having taken the chair,

Mr. D. MILNE WATSON, the General Manager, at once rose, and said: We have asked the Governor to come here to-day in order that we may perform a very pleasant duty—that is to present him with his portrait. Before I say anything of a personal nature, I should like to explain, in a few words, how the idea of this presentation came about. It was in several of our minds that it would be a very proper and suitable thing to present the Governor with some testimony of our affection and regard at the time of the celebration of the Company's centenary. Therefore, some few months ago, a meeting was held at the chief office here, at which most of the heads of the departments and station engineers were present. The question was discussed; and it was decided there and then, with absolute unanimity, that steps should be taken to present this portrait. The next step was the formation of voluntary committees at all the centres of the Company's work. Each centre elected its own Committee, and collected the money wholly voluntarily. I may say a limit was put, so that no one should impoverish himself in his zeal to show his appreciation of our Governor. The Committees received contributions which were privately acknowledged; so that no one knows what his fellow gave. Therefore, I may say that this was an entirely spontaneous and voluntary movement on the part of the staff. Having got the money together, we approached Mr. Fiddes Watt—a gentleman who has won fame in portraiture. Among those whose portraits he has painted are the Prime Minister, Earl Grey, Lord Loreburn, and Lord Haldane; and so we felt we were quite safe in entrusting to Mr. Fiddes Watt the important duty of portraying our Governor's features. I hope you will not be disappointed with the result. We hope to present a photogravure of the portrait to each subscriber; and I am sure will all be glad to have one. [Cheers.] Well, now, gentlemen, I should like to say a few words in regard to the Governor himself, if he will now permit me to do so. The Governor has presided over the destinies of our Company for six years; and I suppose there have never been more eventful consecutive six years in the history of any Company than these of the Gaslight and Coke Company; nor do I think any Company has come more triumphantly out of its struggles than we have done so far. These years have been marked by not only a great expansion in the Company's business, but also by one or two notable events. The price of gas has been reduced to a level only once reached before by the Company—viz., 2s. 6d. per 1000 cubic feet. The Company's borders have been largely extended by means of amalgamations; and, further and lastly, but not less important, we have had the great benefit of co-partnership bestowed upon us as a staff. But even among these material gains, great as they are, to my mind the greatest gain of all has been the new spirit which the Governor has infused into the whole Company. I think this has been particularly marked in recent events. During the strikes, and the labour unrest generally, the men of the Company have remained loyal. I am sure if any further visible proof of their loyalty were necessary, that proof was amply furnished at the meeting at the Crystal Palace a fortnight ago. I am certain that no one could wish to see a more contented and cheerful group of working men than were gathered there to hear the admirable address of the Governor in the theatre of the Palace. May I be allowed to once more thank the Governor and Directors on behalf of the staff and workmen for the magnificent way in which they have celebrated the centenary, which has imprinted itself in the minds of everyone of us? In speaking of this new spirit, there are two common ways of managing men. One way is by inculcating fear in the men by threats and hard driving; the other is by cajolery and flattery, the result of fear on the part of the management. One is as bad as the other. The Governor has shown a third, and better, way of doing it. He has shown that if we treat a man fairly, and give him a higher ideal than he has possessed before, that he will gradually form a more dignified opinion of himself and his occupation. That is the lesson the Governor has taught in the Gaslight and Coke Company. [Cheers.] I think we find the effect of this in all departments. We find it in what the men say when they speak; we find it in what they do, which is still more important. Now, gentlemen, I feel, speaking on behalf of the staff, what a great sense of responsibility it gives us to carry out this spirit—to carry it down to all ranks. It is not enough for the Governor to be imbued with this spirit, but each one of us must

be imbued with it, so that we can carry it down to the ranks below us in the service. I think the heads of the departments will thoroughly agree with me when I say that we owe a debt of gratitude to the Governor. Very often, even in employments the most exciting, there are dull moments. But I can assure you, speaking as I do with knowledge of those departments that come into intimate contact with the Governor, that he never enters a room without our losing at once any feeling of depression. The feeling of hard work which cannot be got through disappears when the Governor appears. He brightens and stimulates, and makes us feel that everything that is worth doing at all, is worth doing well. He gives us the feeling that he is our personal friend; that he understands our case; and that he takes a personal interest in us. These are things that we all appreciate. Of this I am sure, gentlemen, that whatever line of life the Governor might have entered upon—whether politics, law, the church, or any other career—he would have distinguished himself, and would have come out at the top. Although he chose a business career, I do not think anybody who has done as he has—brought happiness into the homes of some 13,000 individual workmen and members of a staff—can be said to have spent his life amiss. [Cheers.] I am sure he has made one corner of the world brighter for most of us; and in that way he has done his duty and served his country as well as many a general on the field of battle. Without saying more, Sir, I will, on behalf of the staff, ask you to accept this portrait. [Applause.]

The portrait was then unveiled; and the life-like features of the Governor were revealed. It is a three-quarter length portrait, with the Governor in characteristic attitude. An old carved, richly gilt frame adds to the charm of the artist's work.

The GOVERNOR (who was received with loud cheering) said: Friends and colleagues, I do not think many of you can realize how difficult it is for me to make acknowledgment, in an assembly like this, and after hearing words like those used by Mr. Watson—words spoken in a way that makes one feel the kindness and sincerity of them—and after witnessing the extremely cordial way in which you have approved and endorsed what he has said. For what has been said, I thank you heartily; and I feel that, inasmuch as they appear to me to be in a measure typical of the spirit which prevails throughout the staff, they are to me doubly welcome. I thank you also for the gift itself. As a modest man, I cannot call it a beautiful picture; but I may say it is an excellent work of art, which will not lower the already high repute of its painter, Mr. Fiddes Watt. This event is one of peculiar interest to me, as you will very well understand. This is our centenary year, of which you have been reminded more than once; and it appears to me that, in a measure, I am reaping the fruit—reaping the advantage—of happening to be the Governor of the Company in this particular year. A hundred years appear to be a very long time. It is a long period. But the length of the period seems dwarfed when I remember that, for more than half of it, I have been actively engaged in the business of the working, management, and control of gas undertakings. Fifty years is half the length of the life of our Company; and I may say that, in the course of this long period, I have, I believe, fulfilled, in my measure, the duties that are now discharged by each individual of the staff now present. I do not think that there is any part of the duty of an officer of a gas company that I have not in my time had to discharge. It is forty years and more since I came to London. I came sacrificing pretty nearly one-half of the income I was enjoying before I came. But I felt the sphere in London was a larger one; and I was willing to take my chance in it. I have done, I think, my share in the work that has gone on in that forty years with regard to the gas supply of London. These remarks are suggested by what Lord Shaw said the other evening—that as every soldier in the army of Napoleon felt that he carried the "baton" of a Field-Marshal in his knapsack so each officer of this Company might look forward to being some day its Chairman. And now I think I may say that this presentation can hardly be charged against me as, in any sense, a matter of vanity. The work, as Mr. Watson has told you, was your own; and although I am very willing to have the result thrust upon me, it is not of my own seeking. But I do not think it is always vanity that leads a man or a woman to desire to leave behind something that will be a memento after he or she has left the stage. I do not know who said it, but he spoke what I think is the sentiment probably of everybody here, when he said, "Lord, keep my memory green." It is a perfectly human desire that, after one's work is done, one shall not go altogether out of the remembrance of those who follow after. That is a natural desire which I, at any rate, feel very strongly. Undertakings great and small are carried on; they may prosper more or less; and they continue for a length of time. But the men who have to deal with the undertakings pass away, and often are very soon forgotten. Now I think a memorial like this—a portrait in the Company's Board-room—will do as much for me in this respect as I can hope for. I am proud to think I shall take my place with those who have in past times done good work for the Company. This will cause those who come after us to say: "Well, in his time, he won the respect and confidence of those about him, and so, with their help, he was able to do something to add to the Company's prosperity." It may seem irreverent; but some of you I have no doubt have seen the story of some men who established in the Western States of America a new town, which flourished and prospered. The leader of them died; and it was decided that they should preserve in the town a memento of this good citizen. So a statue was designed, and was about to be erected. The Committee met to consider the matter; and they decided that the leader's name should be put upon the pedestal. But that did not seem enough. They wanted some testimony as to the value of the man, and so they appointed a Sub-Committee to go out and decide upon an inscription to be added to the name. The Committee returned, and reported in favour of the following: "He did his damnedest; angels could do no more." Apart from the poetry and picturesqueness of the language [Laughter], that was, I think, coming from those men, a superb testimony to the lost friend. It means simply that that man did his very best, and won the esteem of his fellows. And I say with regard to all of us, if it can only be said, after our time has gone, that we did our very best, nothing better could be asked of us here or elsewhere. I should like to say once more how much I appreciate the kindly thought that led to this presentation, and how much I feel the extremely charming way it has been carried through—culminating in the observations of Mr. Watson. [Applause.]

All the members of the staff present subsequently filed past the portrait; and the expressions of opinion were general as to the faithful reproduction of the features of the Governor by Mr. Fiddes Watt.

PERSONAL.

The Oldbury District Council have increased the salary of Mr. ADAM COOKE, the Gas Engineer, by £60 per annum; and the present arrangement continues with regard to his house and the rent and rates.

Alderman HEAP, Chairman of the Rochdale Corporation Water Committee, has been the recipient of a resolution passed by his colleagues on the Committee, congratulating him on the recent attainment of the eightieth anniversary of his birthday.

Mr. A. O. JONES has been presented with a cabin trunk by his friends at West Bromwich, on leaving to take up the duties in connection with the new gas-works at Manilla, with which, as announced in the "JOURNAL" for the 9th inst. (p. 112), he has been entrusted.

Mr. F. H. WEDD has, we learn, been appointed Assistant-Engineer to the South Brisbane Gas Company, and will leave England on the 23rd prox. Mr. Wedd is at present with the Ilford Gas Company, where he has been for some years past. Previous to going to Ilford, he was at Thorneycroft's, with whom he took a position shortly after completing his pupilage at the works of Messrs. George Waller and Son, at Stroud. Mr. Wedd joined the London and Southern District Junior Gas Association at the commencement of its career, and the members will miss him, while, with his many other friends, congratulating him upon his new appointment.

Mr. ALEXANDER MACKAY, of Montrose, who has been appointed, out of forty applicants, Manager of the Motherwell Gas-Works, was for the past eight years Engineer and Manager to the Montrose Gaslight Company. A native of Glasgow, he, on the completion of his apprenticeship as an engineer, entered the Glasgow Corporation Gas Department, and after seven years' service there was appointed to the Montrose Gas-Works—being at that time Assistant Manager. Mr. Mackay has been instrumental in greatly developing the Montrose undertaking; the consumption of gas having risen from 2,000,000 to 34,810,000 cubic feet during his period of office there. The plant has also been greatly improved and extended.

In connection with the report of the proceedings at the recent Wesleyan Conference in Liverpool, the "Methodist Recorder" gave a number of portraits of prominent members of the Society, with a few remarks on their work in connection with it. One was of Mr. EDWARD ALLEN, M.Inst.C.E., Engineer of the Liverpool United Gas Company. Mr. Allen's family attended the Wesley Chapel at Tranmere, Birkenhead, in 1863, and he entered the Sunday School, of which he eventually became Superintendent. He is a class leader and local preacher in the St. John's Circuit, Liverpool, where he is also Circuit Steward. He was for some years Chairman of the Liverpool District Committee of the Local Preachers' Mutual Aid Association.

The South Metropolitan Gas Company's Dividend.—Subject to audit, the accounts of the South Metropolitan Gas Company for the past half year provide for the full statutory dividend at the rate of £5 9s. 4d. per cent. per annum; and the carry-forward will be £154,033.

Masonic.—At the recent annual meeting of the Provincial Grand Lodge of Essex, held at Romford, the Prov. G.M. (Colonel Mark Lockwood, M.P.) conferred the dignity of P.P. Junior Grand Warden on W. Bro. W. D. Child, who had held rank in the Province as P.P.G.Std.B. since 1896. Bro. Child was initiated in the Liberty of Havering Lodge, No. 1437, in 1884—Master, 1894. He was W.M. of the Evening Star Lodge, No. 1719, in 1901, and had served on the Board of Management Royal Masonic Benevolent Institution for fifteen years.

ELECTRICITY SUPPLY MEMORANDA.

A Spiteful Article—Flame Arc Candle Powers Extraordinary—Illumination Good and Bad—Tests of the Inverted Gas-Burner Prove its Efficiency—Sundry Points—Electric Lamp Preferences for Street Lighting—Tramcar Drivers as Arbiters—The Point Fives—Provisional Orders.

THE "Electrical Times" among all our electrical contemporaries is the one that has been most rampant over the decision of the Bournemouth Town Council to supersede electric lighting by modern gas lighting in the portion of the streets at present so illuminated. Our contemporary, in a piece of specious special pleading, has done its best to throw dust in the eyes of the people of Bournemouth. A whole page was devoted to this purpose on July 18; and great care was exercised by some one or more persons to see that those with any influence in governmental matters in the borough were supplied with copies prior to the last Council meeting. In fact, there has been an attempt, by the aid of the article, to stimulate an agitation in the town against accepting the Gas Company's contract. The "Electrical Times," with extremely bad taste, and not in a way that is likely to do good to the Electricity Company whose interests they thought they were serving, attacked the Chairman of the Lighting Committee (Alderman Slade), and suggested that he and his colleagues had dealt with the whole of this question in a slipshod fashion. Our contemporary went upon the lines that any tale was good enough, so long as it gave a highly-coloured side to their case. Instead of Alderman Slade and his colleagues being in this way exposed to the sneers of a prejudiced writer insufficiently informed, they ought to have been commended for the care they had taken in the matter. They had in the trials high-pressure and low-pressure gas-lamps, and electric flame arc lamps and metallic filament lamps fixed in various parts of the borough. And, as the result of their observations—observations made to determine the most suitable lights for the main roads—they passed a resolution instructing the Borough Surveyor to fit up eleven flame arc lamps, and the Gas Company to fix 35 high-power low-pressure inverted lamps, so that they could further judge of their respective values. The Gas Company complied with the resolution; the Borough Surveyor (whom the "Electrical Times" refers to as having been bye-passed) only fitted up *two* flame arc lamps. There was an opportunity bye-passed. Whose fault was that?

In the special article of our contemporary on the subject, the imagination of the writer must, while his pen was running, have been unduly excited; for he spoke of flame arc lamps of 3500-candle power having been offered to the Council for £11 5s. per annum by the Electric Company. Only the week before, the same paper stated that the offer was for 2000-candle lamps; so that the lamps had grown in capacity in the seven days by no less than 1500-candle power. Amazing things do appear in the shape of imaginative candle powers in electrical literature; but the "Electrical Times" knows, as well as we do, that these nominal values that are attached to flame arc lamps are fictitious, and do not bear any relation to actual work, besides which testing authorities have shown that such lamps are not the most valuable for securing well-distributed illumination. As a matter of fact, the gas-lamps are to be spaced at Bournemouth at half the distance proposed for the jumpy flame arc lamps; and therefore the illumination will not have the spottiness that would have been the case with the flame arc lamps. Furthermore, as to the candle powers attributed to the flame arc lamps, we are left wondering how the "Electrical Times" knows that they are of 2000 or 3500 candle power, seeing that it "doubts whether there is such a thing as a photometer in Bournemouth." Our friends may speak for the electricity suppliers, but not for the Gas Company, who are under a statutory obligation to provide and maintain photometrical and other testing appliances.

Our contemporary says a good deal about the candle power of gas-lamps; and it is in this connection particularly that we accuse it of trying to throw dust in the eyes of the people of Bournemouth. All through parts of the article, there is an endeavour to convey the impression that a 600-candle power light by means of a low-pressure inverted gas-lamp is not a realizable and maintainable duty. Now perhaps our friends whose souls are so sorely vexed are not aware that the Gas Company were the only competitors who *did* guarantee a definite standard under proper tests; and the Lighting Committee could not get any such definite guarantee from the electrical people. But what the "Electrical Times" is fully aware of is that the gas industry, through the Gaslight and Coke Company, was the first to accept illumination as the basis of contract for street lighting, and that the electrical industry did not lead the way in this matter. It also knows that in Westminster, Holborn, and the City, the Company named are under illumination power tests and penalties in connection with both high and low pressure lamps; and it is also cognizant of the fact that in Westminster the reports of the City Engineer show that his tests always find the lamps in excess of their contract illuminating power. We challenge the "Electrical Times" to traduce these Westminster tests in the same manner that it has been trying to inflict injury upon incandescent gas lighting in the eyes of the people of Bournemouth. It dare not do it. The tests that have been made in Westminster, and those that will be made in Holborn and the City, refer to lamps of somewhat similar construction to those that are to be adopted at Bournemouth, but, with the new larger power burners, a higher efficiency per cubic foot of gas consumed per hour is obtained. Moreover, the lamps that won favour at Bournemouth are the identical ones that won the lighting contract at Doncaster, where the Corporation own both the gas and electricity undertakings, where competitive tests were made, where the Gas and Electrical Engineers got out curves and much else which conclusively proved that the highest minimum candle power found in the streets was in those lighted by the gas-lamps, and that in these streets there was a more even illumination than in those experimentally lighted by the arc and metallic filament lamps. Where, then, is the ground for the vilification by our electrical contemporary of these incandescent gas-lamps, and for the sneer that 200-candle power per burner "is a truly remarkable figure for low-pressure gas." This sneer displays the vast ignorance on the subject of the electrical writer. All that is said throughout the article shows that the writer knows nothing whatever of the lamps. There are several low-pressure lamps on the market that will give 40 candles per cubic foot of gas consumed per hour. There is nothing remarkable about this to-day. The efficiency is proved by photometrical tests, and is certainly not disproved by such cheap sneers as those that appear to be freely at the command of our electrical contemporary.

There are a few sundry points in the article which reveal the state of mind our electrical friends are in over this matter. It is remarked that "whereas the Gas Company asked for a five years' contract—the lamps to remain their property at the end of this time—the Electricity Company were willing that the Corporation should have the lamps free at the end of a seven years' contract." Will the "Electrical Times" tell the people of Bournemouth what part of the flame arc lamp would be of any real service to them at the end of seven years? The term taken for the depreciation of flame arc lamps is usually five years; and with their rapid deterioration through the corrosive fumes of the lamps, they would want renewing, and that badly, by the end of the seven years' contract. That sop will not do. The Electricity Company knew what they were offering. As to metallic filament lamps, as they require renewing on an average two or three times a year, they need not be taken into account. Then there is the question of scrapping the existing electric fittings. Scrapping happens in any case where an improvement is effected; but our electrical friends do not appear to have been informed that, in the estimated saving by gas, allowance has been made for reducing the capital. A further point that worries our friends is as to how mantles will stand the vibration due to suspension from tramway pillars. The answer is that the present lamps have been in position about two months; and the mantles are standing excellently—far better than would have been the case with the metallic filaments, which become increasingly brittle with use, and are at their worst for standing vibration during the hours of daylight, when they are cold. The fact of the matter is the Lighting Committee of the Bournemouth Corporation and a majority of the members of that body have acted very wisely, after having carefully observed an actual installation which has been in operation some two months or more, and which enabled them to make comparisons on the spot not only with old electric lamps, but with the new ones.

As our pages have shown recently, there has been quite a revival of interest in street-lighting matters. Local authorities are on improvement intent, as they realize that good—not excessive—street lighting adds to the attractive appearance of a town. It was noticed the other day that in Paris an effort is being made to get the shopkeepers in the Rue de la Paix to keep their windows unshuttered, and the lights going in them until a late hour at night time, in order to assist in attracting more promenaders to the street. The magnetic power of light is great. Of that there is no doubt whatever. But while people want plenty of light, they do not want glare. A paper that Mr. C. E. Stephens read before the American Institute of Electrical Engineers deals largely with this matter. He regards as defects of modern developments, the absence of properly diffused light, and the use of high intrinsic brilliancy units so placed as to violate the physiological requirements for satisfactory street illumination. But unfortunately in dealing with the subject Mr. Stephens confines himself to electric-lamps, though he agrees that, in any illumination scheme, it is objectionable to use a source from which the light flux issues from a point. He finds this particularly true of street lighting where large electric units are employed, since it is quite impracticable to support the lamp at such a height that it will not come within the field of vision at a time when the observer is quite near it. The only remedy for this state of things is the employment of suitable glassware. Mr. Stephens, choosing between arc lamps and clusters of metallic filament lamps in main streets, much prefers the former when the source of light is suitably robed with glassware. Cluster metallic filaments are an abomination in his sight. They are not situated on such high standards, and so are brought within shorter range in the field of vision. Cluster lighting is only an excuse for reducing the cost of installation. He admits that there is something attractive in the clusters—at first. But the public soon tires of the novelty; and the tiring is hastened by tortured eyes. Local authorities had better consult gas-lighting engineers.

In the course of the discussion that has been proceeding in the "Electrical Times" on the subject of street lighting, a letter appears from Mr. Roland Marshall, of Ayr, in which he gives a little bit of testimony from the man on the tramcar on the point of preference between flame arc and metallic filament lamps. It will be seen that choice of lamp is limited. The Corporation of

Ayr put up sample flame arcs and metallic filament lamps along the tramway route; and then asked their 29 tramway drivers which form of light they preferred. Only four favoured the flame arcs; the remaining 25 were partial to the metallic filaments. The reasons advanced for their preference by the 25 were these: 23 drivers said the light was clearer and steadier; 12 drivers said there was much less risk of extinctions; 10 drivers said the light was distributed over a wider area; 10 drivers said the lighting was more uniform; 9 drivers said flame arcs cast very dark shadows, which were misleading when passing anyone or anything on the road; 2 drivers said the light from the flame arcs was sore on the eyes; 1 driver said he could distinguish persons or objects on the road better. It does not appear from Mr. Marshall's letter whether the tramcar drivers have been given a chance for forming judgment with high and low pressure gas-lamps of modern type.

A new club has been formed. It is the Point Fives Club. There does not seem to be anything particularly tangible about it, excepting the members when they meet. They have held one meeting; but future gatherings seem to be of the *sine die* order. The qualification for membership is that one must be the engineer and general manager of a concern supplying electricity at 0·5d. per unit for one or more domestic purposes. There are only about eight eligibles at the moment; and there seems to be a looseness about the rule for eligibility, inasmuch as some of the gentlemen who are members are supplying not at 0·5d. per unit, but at a lump sum down per quarter or year and 0·5d. per unit afterwards for the current consumed. There is a sweet deception about these Point Fives. It does not appear that there is much chance of the 0·5d. becoming generally a flat-price without the primary lump quarterly or annual charge. The Point Fives confessed as much at their first meeting. The official report states that, as to tariffs, it was not (during a discussion of the matter) generally agreed that a universal flat-rate would be the eventual outcome of the present attention being paid to tariffs; but it was unanimously held that it was desirable and quite possible for a differential rate to be evolved with a universal secondary charge per unit of 0·5d. or lower, and a primary charge varying in accordance with the locality, the costs of production of each particular undertaking, and the nature of the service required by the consumer. It was considered that the great difficulty to be overcome was the method of arriving at the primary charge and its application in a convenient form to the consumer, and so framed as to bring in from each different class of consumer an approximately uniform rate of profit. That will be difficult.

The report of the Board of Trade respecting the applications to them for Provisional Orders under the Electric Lighting Acts shows that 36 applications had been made to them by the close of last year, 17 being by local authorities and 19 by companies or persons. Thirty-one of the Orders were granted, but not all of them in their entirety. In some cases, the Board dispensed with the consent of the local authorities where this had been withheld; while in other instances, they declined to grant the Orders without the consent of the local authorities. In the case of the application for the Newton-in-Makerfield Electric Lighting Order, the Board "were not satisfied that an undertaking could be established without involving considerable risk of loss to the District Council; and in the circumstances the Board refused to grant the Order." There has been a great deal of loss through the granting of Provisional Orders to local authorities in unsuitable areas for electricity supply; and it is a good thing to see the ratepayers of one district saved from the oft-occurring penalties of municipal speculation of this order. Since the date of the last report, the Board have approved of deeds transferring the powers, duties, and liabilities of eleven municipal undertakers to existing or new electric lighting companies. A table at the end of the return shows that, since 1883, 1414 Electric Lighting Orders have been applied for, 1130 have been made by the Board of Trade, 1113 have been confirmed by Parliament, and 346 have been revoked. This leaves 767 in existence and in operation.

Woodall-Duckham Verticals for Bristol.

The Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, of Palace Chambers, Westminster, have secured a contract with the Bristol Gas Company for sixteen settings of four retorts (having a total carbonizing capacity of 288 tons of coal per twenty-four hours), together with the requisite coal and coke handling plants.

An invitation was recently received to inspect Gidea Park Cottage at the Latin-British Exhibition. As the "JOURNAL OF GAS LIGHTING," we hardly know why the invitation was sent; but from the personal point of view, the visit was interesting, and we will say at once that the house demonstrates that artistic merit and a moderate price for building and furnishing can go hand in hand. The house is furnished in quite an up-to-date style by Messrs. Oetzmann and Co., Limited, of Hampstead Road, N.W. It is electrically lighted, and has a large coal-range in the kitchen; while the fire-places in the various rooms are also arranged for the consumption of solid fuel. But the representative of the firm told the visitor that they would be equally pleased to fit up the house with modern gas-lights, gas-fires, range, and water-boiler, without any additional cost—in fact, we can see that the firm might save money by fitting up the house with gas lighting, heating, cooking, and hot-water appliances.

THE GASLIGHT AND COKE COMPANY.

THE following is the report on the working of the Company during the six months ending June 30, which, with the accounts (an abstract of which appears below) will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £15,000 towards the redemption fund, and contributing £20,000 to the special purposes fund, there remains a profit balance of £428,028 3s. 3d. The amount brought forward from the previous half year (including the balances from the amalgamated Companies) was £739,831 17s. 1d. There is therefore a total available balance of £1,167,860 0s. 4d., out of which the Directors recommend the payment of a dividend on the ordinary stock at the rate of £4 17s. 4d. per cent. per annum, which will absorb £399,452 2s. 2d., and leave £768,407 18s. 2d. to be carried forward to the credit of the current half year.

There has been an increase during the half year of 1·94 per cent. in gas sales, of 10,279 consumers, and of 24,451 gas-stoves sold and let on hire.

Owing to the coal strike and other causes, the price of coal has increased materially since the last contracts were made, and consequently those for the current year will show a considerable advance.

During the half year under review, the price of residuals has been well maintained.

The amalgamation of the Barking and Chigwell Gas Companies with the Gaslight and Coke Company having taken place on the 1st of January last, the accounts of these Companies are included in the accounts now submitted.

Since the last report, the Company has celebrated its centenary by entertaining the staff and other employees; and the Directors are glad to know that these festivities were much appreciated by all who took part in them. The centenary book published by the Company is being issued to each shareholder with this report.

The Directors have given an order for the building of a ship to be used for the purpose of carrying a portion of the Company's coal supplies; and they trust that she will commence running during the current half year.

The past half year has been marked by two disastrous strikes—the coal strike which lasted six weeks, and the transport workers' strike which is still unsettled. But, notwithstanding these disturbances, the Company has been able to maintain an uninterrupted supply of gas.

The Directors have pleasure in announcing that the employees of the Company have formed an approved society in connection with the National Insurance Act. This Society has now about 9500 members.

The Court of Directors has been furnished by the several Engineers of the manufacturing and distributing departments respectively with the usual certificates that all the Company's works and plant have been maintained in thorough efficiency.

Horseferry Road, Westminster,
July 18, 1912.

CORBET WOODALL, Governor.

The accounts of the Company for the six months ended June 30, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £168,360, the total amount of the Company's existing capital powers is £23,078,075. The statement of loan capital stands thus: Total paid up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,957 14s. 8d.) to the amount of £29,571,882 14s. 8d. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1911—			
Gaslight and Coke Company			£14,598,472 14 7
Barking Gas Company			164,605 4 0
Chigwell, Loughton, and Woodford Company			114,252 10 7
Expenditure during the half year to June 30, 1912—viz.,			
Buildings and machinery in extension of works	£15,153 16 2		
New and additional mains and service-pipes	13,893 12 10		
Do. do. meters	13,313 6 2		
Do. do. stoves	24,087 1 10		
		65,447 17 0	
			£14,943,778 6 2
By sale of surplus land	£2,015 13 4		
By depreciation of plant	15,582 11 0		
By depreciation of meters and stoves	56,814 14 5		
		74,412 18 9	
Total expenditure			£14,869,365 7 5
Nominal amount added on conversion			14,451,145 0 0
			£29,320,510 7 5
Deduct amount of capital redeemed under Company's Act of 1903			168,360 0 0
			£29,152,150 7 5
Balance of capital account			419,732 7 3
			£29,571,882 14 8

The following is the revenue account [see footnote] :—

Expenditure.

June Half Year, 1911.		£ s. d.	£ s. d.
	Manufacture of gas—		
£618,656	Coal, including all expenses thereon .	544,162 12 5	
45,625	Oil ,, less value of oil tar	57,073 8 8	
40,044	Coke and breeze used in the manufacture of carburetted water gas . . .	53,039 16 7	
16,783	Salaries of Engineers and other officers at works	17,327 14 7	
97,699	Wages	102,627 12 2	
14,155	Purification	15,421 4 3	
239,307	Repair and maintenance of works and plant, materials and labour, less received for old materials, £4918 0s. 7d. .	218,595 11 5	
	Distribution of gas—		1,003,248 0 1
54,394	Salaries and wages of officers (including rental clerks).	60,113 8 3	
83,473	Repair and maintenance of mains and service-pipes, &c.	99,103 1 9	
74,607	Repair and renewal of meters . . .	80,763 8 1	
76,570	,, ,, stoves	87,955 18 5	
25,135	Gas fittings, including labour (automatic meter supplies)	29,427 3 4	
			357,361 19 10
26,490	Public lamps—lighting and repairing . .	..	28,059 0 7
	Rents, rates, and taxes—		
6,877	Rents payable	7,083 10 6	
156,861	Rates and taxes	162,467 7 1	
	Management—		169,550 17 7
4,410	Directors' allowance	3,750 0 0	
312	Company's Auditors and Assistant . .	312 12 0	
9,798	Salaries of General Manager, Secretary, Accountant, and clerks . . .	10,057 15 1	
25,975	Collectors and cashiers	27,352 1 0	
4,599	Stationery and printing.	5,311 17 6	
6,417	General charges	6,253 10 11	
			53,037 16 6
	Co-partnership for 12 months to June 30, 1912	40,869 11 7	
16,632	*Less* On Account	18,000 0 0	
			22,869 11 7
1,219	Parliamentary charges	..	249 6 10
1,362	Law charges	..	1,741 12 6
150	Charges *re* Quinquennial re-valuations .	..	..
8,076	Bad debts	..	6,653 9 9
500	Depreciation fund for works on leasehold lands	..	500 0 0
26,577	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	26,803 1 1
..	Retiring allowances under the Company's Act of 1911	..	15,924 12 0
1,635	Workmen's compensation account . . .	..	2,679 14 7
..	Balance of stamp and conveyance duties under the Company's Act of 1911 .	..	132 10 0
	Public officers—		
1,256	Gas Referees and Official Auditor . .	1,210 3 11	
551	Public testing-stations	837 16 0	
			2,057 19 11
£1,686,145			1,695,870 12 10
700,198	Balance carried to net revenue account		676,288 7 8
£2,386,343			2,372,159 0 6

Receipts.

June Half Year, 1911.		£ s. d.	£ s. d.
	Sale of gas—		
	Per meter, at 2s. 6d., 2s. 9d., 3s., and		
£1,601,114	2s. 2d. per 1000 cubic feet	1,573,332 11 9	
63,776	Public lighting and under contracts . .	65,763 3 9	
			1,639,095 15 6
£1,664,890			
68,282	Rental of meters	..	70,412 4 9
56,637	Rental of stoves	..	61,421 2 1
58,157	Rental of fittings	..	71,052 12 1
	Residual products—		
£322,591	Coke, less £38,221 14s. 9d. for labour, &c.	308,135 3 0	
23,641	Breeze, less £8935 10s. 9d. ,, . .	25,580 12 0	
67,901	Tar and tar products	72,754 18 6	
119,187	Ammoniacal liquor and sulphate of ammonia.	218,201 2 7	
			524,671 16 1
£533,320			
£4,740	Rents receivable		5,180 10 0
317	Transfer fees		325 0 0
£2,386,343			2,372,159 0 6

Note.—The corresponding figures for the June half year, 1911, in this account and where given in the following accounts, include those of the Barking and Chigwell Gas Companies.

The net revenue account is fuller than usual, as it contains the balances from the net revenue accounts of the Barking and Chigwell Companies on Dec. 31, 1911, less the dividends for the half year to that date. The total is £1,417,807, compared with £1,343,394 at June 30, 1911. On the debit side of the account, there is an item of £5580, the "cost of entertainments to staff and workmen in celebration of the Company's centenary." The balance applicable to the redemption fund and to dividend on the ordinary stock is £1,182,860 os. 4d. ; and the following statement shows how it is proposed to appropriate it :—

June, 1911.			
£638,496	..	Net balance brought from last account	£739,831 17 1
480,098	..	Net revenue for the half year	428,028 3 3
£1,118,594			£1,167,860 0 4
15,000	..	Contribution to redemption und	15,000 0 0
(£4 14s. 8d. p. ct.)		Dividend on the ordinary stock—	
£389,593	..	£4 17s. 4d. per cent. per annum on £16,415,840 .	399,452 2 2
£714,001	..	Balance carried to next account	£768,407 18 2

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on June 30 : Reserve fund, £67,943 ; special purposes fund, £241,416 ; depreciation fund, £80,492. The reserve fund includes the reserve balances of the Barking and Chigwell Companies (£5069 and £2100) ; and the special purposes fund is debited with a sum of £18,358, the extra cost of coal during the miners' strike.

The following statements relate to the working :—

Statement of Coal, &c., Used.

Description of Coal.	In Store Dec. 31, 1911.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1912.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . . .	235,146	769,546	877,877	1405	125,410
Cannel . . .	2,528	2,864	3,777	..	1,615
Total . . .	237,674	772,410	881,654*	1405	127,025

* In addition to this quantity of coal, 8,475,280 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1911.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, June 30, 1912.
Coke—tons	22,736	557,556	118,304	432,844	29,144
Breeze—tons	3,860	92,568	11,543	80,179	4,706
Tar, from coal only—galls.	1,374,474	8,556,523	7,987,403	488,179	1,455,415
Ammoniacal liquor—butts	22,666	308,168	298,750	17	32,067

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*14,566,457	473,541	12,894,706	13,530,694	47,326
†14,404,901	461,044	12,652,221	13,284,776	47,117

* Including 3,456,28 ,000 cubic feet of carburetted water gas. † June half year 1911.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows : Coal, £78,534 ; gas oil, £8712 ; coke, £19,100 ; tar and ammoniacal liquor and products, £93,432 ; and sundries, £272,340. The figures this time last year were : Coal, £59,107 ; gas oil, £38,253 ; coke, £24,741 ; tar, ammoniacal liquor, and products, £95,824 ; sundries, £266,906.

INSURANCE ACT [PART II.] AND GAS WORKERS.

Position of Gas-Fitters Engaged in Piping Houses.

We learn from Mr. Alex. Wilson, of Glasgow, that several correspondents have written to him with reference to a decision (No. 407) of the Umpire under the National Insurance Act, to the effect that contributions are payable in respect of "workmen employed by a gas company, and described as gas-fitters who are engaged wholly or mainly in the work of piping customers' houses and repairing for escapes of gas." The writers appear to consider that this decision clashes with one formerly given by the Umpire, and also with the report of the Committee of the Gas Companies' Protection Association [*ante*, p. 107], regarding gas-services. It appears to Mr. Wilson that the decisions of the Umpire are quite consistent. The report of the Committee states that contributions would have to be paid for workmen wholly or mainly employed on gas-pipes for carcassing "buildings;" but when engaged on branch or service work they would be excluded. He thinks the decision in question applies only to the permanent pipes in a building, and is therefore quite in line with the former one. The "Board of Trade Journal" for the 18th inst. contained a decision (No. 405) excluding "workmen engaged in erecting sun-blinds on houses, and preparing same for erection." Taking this into consideration, and seeing that all work on gas-fittings—*i.e.*, brackets, gasaliers, &c.—and also on removable gas-stoves, is excluded from the Act, Mr. Wilson thinks that it may be assumed, unless the Umpire decides otherwise, that the work done in fitting gas-fires and gas-cookers is also excluded from the Act ; these not being permanent parts of a "building."

Additional Decisions by the Umpire.

Since the last list of decisions given by the Umpire appeared (*ante*, p. 175), the following have been published.

Contributions are payable in respect of—

Workmen employed by a firm of flexible metallic tubing manufacturers, and described as engaged in fitting the connections to flexible metallic tubing, used principally for steam and hydraulic pressure, oil, and gas purposes.

Workmen employed in the manufacture of water-meters, and in the manufacture (founding and finishing) of large valves for bulk supplies of gas and water.

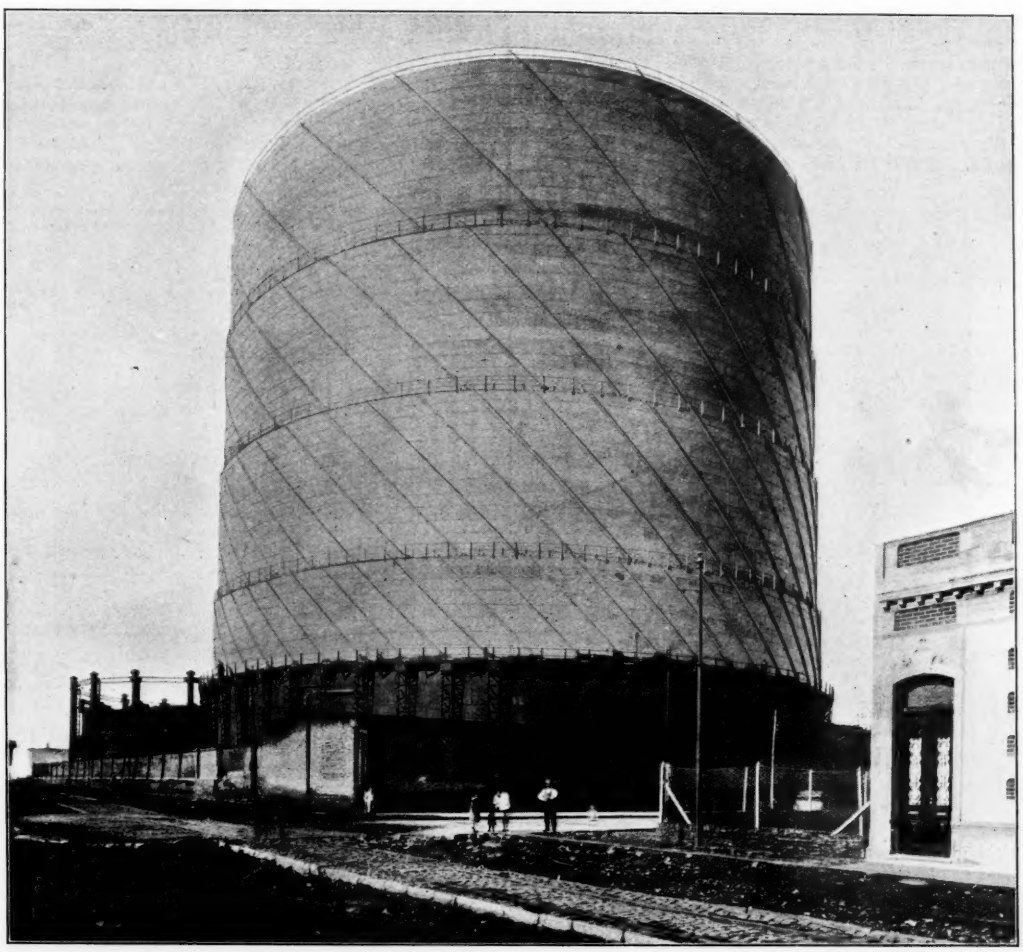
Workman described as a gas-fitter, fixing and running pipes and fittings to buildings.

Workmen engaged in the construction, reconstruction, or alteration of coke-ovens or bye-products plant.
Workmen employed by a town council, and described as gas-fitters engaged in fitting-up pipes in consumers' premises and as water-meter repairers.

Contributions are not payable in respect of—

Workmen employed by water companies, and engaged as waste-water inspectors, waste-meter inspectors and their assistants, or in mixing lime for water softening, and in cutting grass.
Workmen employed by a firm of manufacturers of silk shades for gas and electric light fittings, &c., and engaged wholly or mainly in cutting and sewing silk or to wire frames, and making wire frames.
Workmen employed in the gas department of a city council, and described as turncocks, drillers, drilling holes in gas-lamp pillars; painters, painting gasholders, lamps, and meters; labourers employed at times to test pipes and taps; pressure-men who take records of the pressure of gas in the mains; and tube threaders.
Workmen employed by an electricity supply company, and engaged in the work of cleaning, overhauling, repair, and general maintenance of arc and incandescent lamps; meter fixers engaged in fixing removable meters and brackets.
Workmen employed by a firm of engineers, and engaged in adapting gas and candle fittings for electric light.
Workmen employed at chemical works, and described as tar and oil still men, benzol men, boiler firemen, and ammonia still men, and their assistants, process men, coopers, and labourers.
Workmen engaged in making tin sheet, copper, and galvanized ventilators, stoves, &c.
Workmen described as painters engaged in painting street-lamps.
Workmen employed in the repair of ovens for the manufacture of coke and of bye-product plant, other than buildings or machinery.

INAUGURATION OF A SPIRAL GASHOLDER AT BUENOS AYRES.



THE Secretary of the Primitiva Gas Company of Buenos Ayres, Limited (Mr. J. M. Macmorran), sends, by request of the Company's General Manager (Mr. William Angus), the accompanying photograph of a new spiral gasholder recently erected in Buenos Ayres for the Primitiva Company, and which was inaugurated by Mr. A. E. Bowen, the Chairman of the Company, during his recent visit to Buenos Ayres.

The gasholder, which is 200 feet in diameter and stands 200 feet above the ground-line when full, has a capacity of 4½ million cubic feet, and is the largest of its type south of the Equator. It has been constructed by Messrs. C. & W. Walker, Limited, of Donnington, and has taken two years to erect.

Over 2000 tons of steelwork has been used in its construction; and the tank contains more than 40,000 tons of water. It is to be used for the supply of gas to the north side of the City of Buenos Ayres, and was erected at enormous cost to the Company.

Mr. Bowen, at the inaugural ceremony, made a short speech, in which he traced the history of the Company, and gave some interesting details as to the plant which was then being brought into use. Mr. Angus replied saying that it was very fortunate indeed that they had the pleasure of having Mr. Bowen with them on so important an occasion. On the great progress that had been made by the Company there was really no necessity to enlarge at present. The gigantic gasholder which towered above them was a standing monument to the development and progress of the Primitiva Gas Company.

Mr. J. M. Rowbotham (the Chief Engineer of the Company) heartily congratulated the General Manager on the termination of such a colossal work; and, *en passant*, he wished Mr. Angus a very pleasant time during his projected pleasure and business trip to Europe.

Messrs. C. & W. Walker, as Contractors, were also congratulated on the good work accomplished by them.

Mr. Samuel Hale Pearson, the President of the Local Committee, was present at the inauguration, as also were Mr. Charles Lockwood, a Local Director, Mr. E. J. Wilson, the Chief Accountant, Mr. H. Dobson, the Treasurer of the Company, and numerous members of the technical and administrative staff.

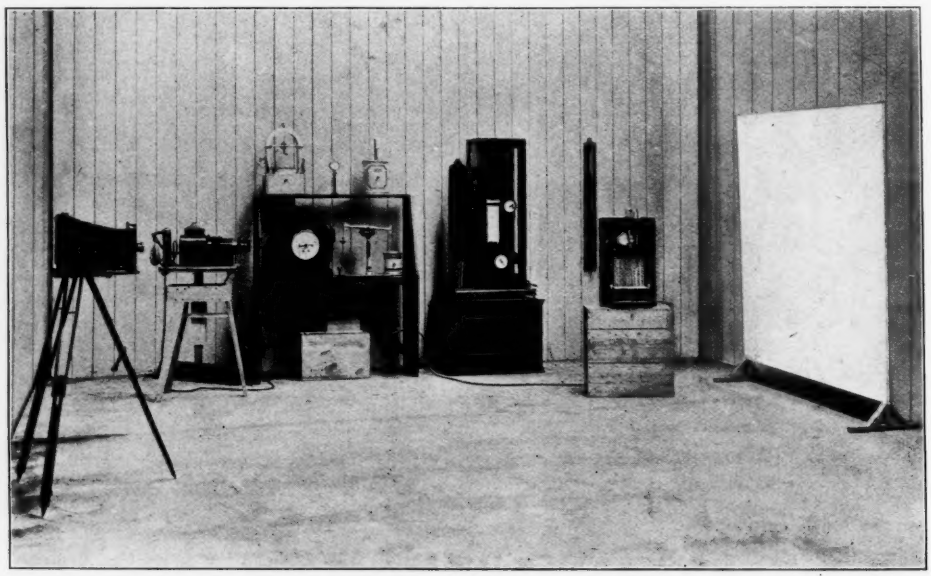
The Panama Canal, which is now nearing completion, is to have a novel system of illumination for its lighthouses. The gas used for the flame is acetylene; but it is stated that the sun—100 million miles off—is to be the lamplighter! The lamps will be fitted with copper cylinders exposed to the air. When the sun rises, its rays will cause the cylinders to expand and so close valves which admit gas to the burners. As the sun goes down and the air cools, the copper cylinders will contract, so opening the valves and admitting the gas to the burners, where it will be lighted by small pilot-jets resembling the ordinary bye-pass.

DAVIS'S "SHADOWGRAPH" METHOD OF TESTING GAS-FIRES.

A New Standard of Hygienic Efficiency, and a Gas-Fire that Complies with It.

THE Davis Gas-Stove Company have set up a new standard and a new test for the hygienic efficiency of gas-fires. The technical staff at the large works at Luton have devised the test; and the test has produced the standard that defines absolute immunity from any escape of products of combustion other than from the place provided for the purpose by designers of a fire, and that when it is unassisted by the natural draught of a house chimney or a gas-fire flue-pipe. The practical result is that the technical staff here have, by the aid of theory, deduction, and practical experiment, designed a gas-fire that they demonstrate by the test complies, without the shadow of a doubt, with the new standard of hygienic efficiency—a standard that the firm claim should be met by every fire that is placed upon the market. The test is one that, if approved, can be applied by every maker and every large buyer of gas-fires; but to the Davis Company must be given the credit for originating it. Unless there are maintainable scientific objections against the test—at present we have not been able to discover any (after having examined the test, and watched in every detail a demonstration, during an entire afternoon) of a sufficiently substantial character to uphold against the experience of those who have been working with it for some months past—there is ground for thinking that it will become a factor in the regulation of the conditions of gas-fire construction, and one of the standards of efficiency that will regulate commercial transaction. It will be seen from this statement that we, on our own part, are quite open to the consideration of anything that can be said as to the value or otherwise of the test, while the technical staff of the Davis Gas-Stove Company are, on their part, prepared to consider and discuss any criticism that can be advanced. Whatever happens in this regard, whatever can be said as to its validity as a perfect test, there is this to be submitted in its favour, that it has simplicity and rapidity to commend it as an indication of hygienic efficiency—a rapidity that cannot be claimed by the taking of samples of air in a room and subjecting them to chemical analysis, which is a test subject in a measure to the disturbing influences set up by other conditions, and particularly by the presence in a room of those who are engaged in the experimental chemical work.

The Davis "Shadowgraph" test was seen and demonstrated in a dwelling-house close to the Luton works. This house is one that the Company have taken and devoted to experimental work conducted under actual conditions of the use of gas appliances. Samples of all the heaters made by them for household purposes —heaters for warming, ovens for cooking, and hot-water appliances—are brought here, away from the circumstances and refinement of the laboratory, for efficiency tests under the conditions of an ordinary dwelling-house. One of the first observations on entering was that not only gas appliances, but electrical ones are brought to this investigating centre. With a view to keeping the technical staff of the Company acquainted with what electrical competitors are doing, there is an electricity supply laid on to the



General View of the Apparatus employed in the Shadowgraph Test.

house, and electric radiators and cooking appliances are installed to ascertain the lie of the competitive land, which expression we hope our electrical friends will take quite in the literal sense. In passing, it is noticed that the switchboard of the electrical cooker —a cooker much favoured by a certain London Borough Electricity Department—is one that would cause many hours of bitter study and many sleepless nights to the maiden fair of the kitchen who is responsible for the operation of the switches, and the products of the cooker's auxiliary aid to her own efforts. This in passing.

THE "DAVIS" SHADOWGRAPH TEST.

We will go at once to the room that is the objective of our visit, where the "Shadowgraph" test is carried out. The object of this test is to enable the investigator to observe by optic methods, whether or not the particular gas-fire under test is allowing any of the products of combustion of the gas to escape beneath the canopy when the fire is working at maximum efficiency, unaided by any form of flue-pipe or chimney draft—it having been definitely laid down as a standard of hygienic efficiency by the technical staff of the Luton works, that any gas-fire which is to be considered hygienically satisfactory must be capable of passing all its products through its flue, unaided by chimney draught when the fire is working at its maximum efficiency.

In the chemical methods hitherto used for investigating the condition of the air in the immediate vicinity of a gas-fire canopy, carbonic acid is used as the indicator of contamination; but the "Shadowgraph" method is based entirely on physical principles—water vapour being the indicator in this method of testing which may be described in the following manner. The first illustration is a general view of the apparatus used, set up ready for carrying out a test. In the background will be seen gas measuring and pressure regulating apparatus of the most up-to-date type, the value of the gas being continually indicated by means of the recording calorimeter, also seen in illustration. The gas from the measuring apparatus is conveyed to the fire under test (a fire of any make) by means of flexible metallic tubing. The fire is placed upon a stand, and so arranged that a shadow of its profile formation is projected on the screen by the lantern shown on the left-hand side of the illustration. This image is photographed by means of the camera shown in the foreground; but it is the image only of the gas-fire shadow. On the fire a glass plate is fixed having one side cut to exactly follow the formation of the fire front. The second illustration (which shows one of the Davis new barless gas-fires with the detector-plate attached) will make this perfectly clear. This is a general description of the arrangement of the apparatus employed.

THE DETECTOR-PLATE AND ITS USE.

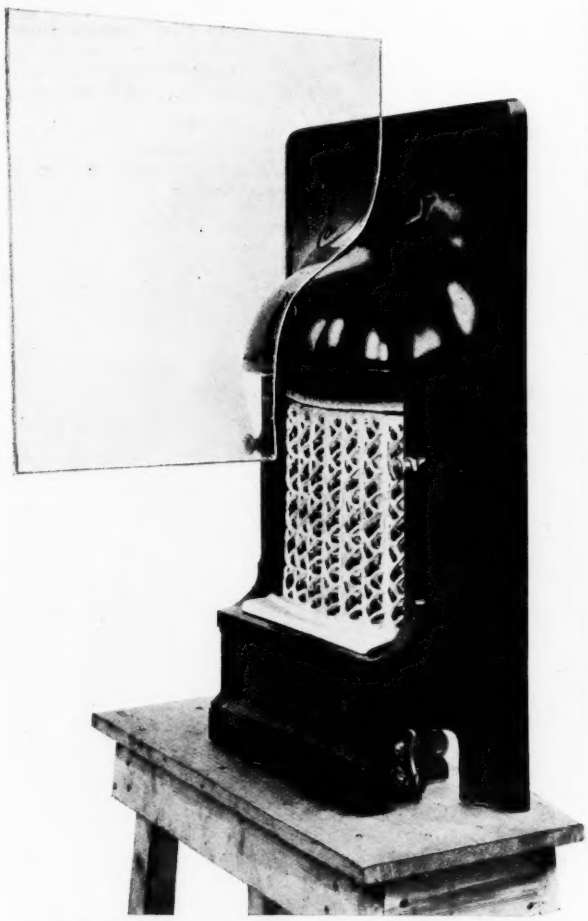
The detector-plate referred to above, and shown in detail in the second illustration, consists of a thick piece of plate glass. This glass is carefully cooled in an ice-bath to such a point that its temperature is slightly above the dew-point of the normal air of the testing-room.

One of the main products of combustion of coal gas is water, which is produced in the form of steam. Air which has been contaminated with these products of combustion therefore contains a larger amount of water, with the result that it has a higher dew-point. Therefore, if the detector-plate be partly in normal air and partly in air which has been contaminated by the products of burning gas and its temperature is correct, the portion of the plate in contact with the contaminated air will receive upon its surface a film of condensed moisture; thus detecting the presence

of products by means of the relative dew-points of contaminated and uncontaminated air.

During the progress of a test, after the fire has been alight for a sufficient time to allow the conditions to become steady, a detector-plate is put into position at the fire-front; and, in the event of contamination, a film of moisture is deposited on the plate—thus rendering it partially opaque, with the result that the shadow of the film is thrown on the screen, and thus, when a photograph of the image is taken, it produces a permanent record of the result obtained.

In the case of a gas-fire which is not bye-passing any of its products of combustion beneath its canopy, no raising of the dew-point of the air in the immediate vicinity of it takes place. The dew-point remains the same as that of the normal air of the testing-room; and as the temperature of the detector-plate is slightly above the dew-point of the air, no moisture is deposited upon its surface, and no shadow is thrown upon the screen, other than that of the gas-fire profile.



Davis's New Barless Fire—Showing Detective Plate in Position.

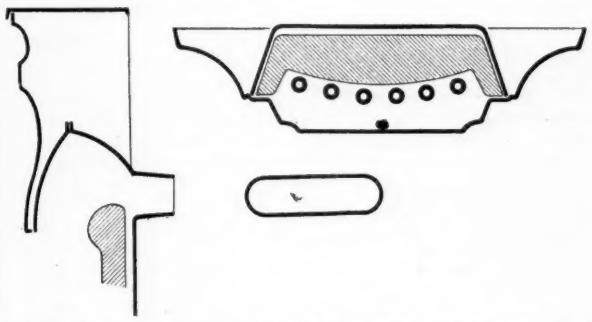
One of Several Tests.

A test was carried out in our presence with a fire (not of the Davis type) which showed a considerable shadow; and it was found that, although an elbow and vertical flue-pipe to the extent of 3 feet were attached, the shadow, although reduced in size, was still quite noticeable. Not until 5 feet of vertical pipe had been attached, did the shadow entirely disappear—thus showing that, not only did this particular fire allow its products to escape beneath its canopy when unaided by chimney draught other than that produced by the natural construction of the fire, but it also required an unduly large length of flue-pipe to produce the pull required to ensure that no bye-passing took place.

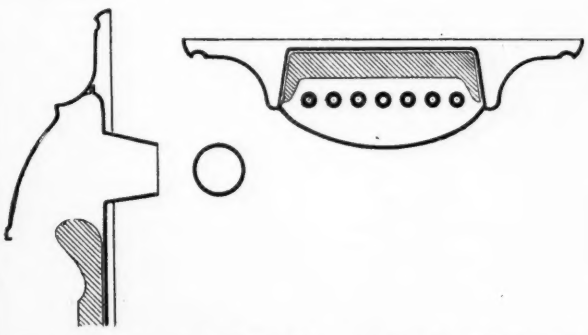
A High Standard, and a Fire which Complies with It.

From these remarks the general method of procedure, and the principles upon which the Davis "Shadowgraph" test is based, will be clear; and it will be apparent from the explanation that the Davis Gas-Stove Company have set up a high standard of efficiency in this respect, as the detector-plate is capable of indicating even slight contamination of the air in the immediate vicinity of the canopy of the gas-fire.

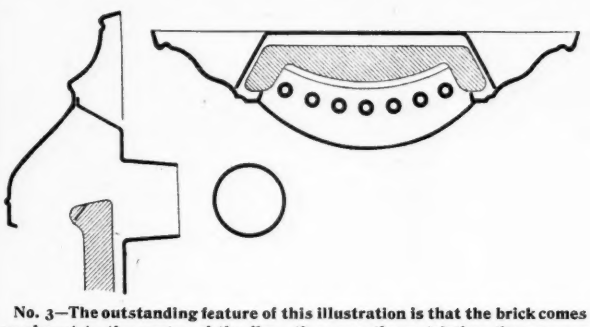
Many interesting confirmations of the results obtained were shown, particularly in the case of one of the new Davis barless gas-fires, which, on test, presented no signs whatever of contamination when the detector-plate was put in position; but, immediately a damper was placed on the flue-outlet, a shadow of great density and extent was immediately thrown upon the screen—showing conclusively that the shadow produced by the film of moisture is an undoubted indication of the presence of products of combustion in the air so examined.



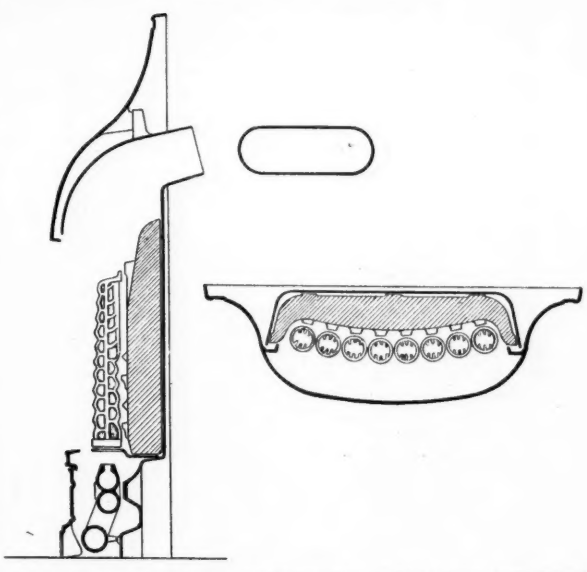
No. 1—Shows the fire with a large well-shaped flue, and the canopy well covering the burners. The height of the centre of the flue above the canopy is very small; and there is a decided pocket above the flue. The brick has a slight tendency to throw the gases forward, and obstruct the passage to the flue.



No. 2—The shape and size of the flue are incorrect; and the canopy is decidedly lacking in cover at the sides. The flue is, however, fairly above the bottom edge of the canopy; but there is a distinct pocket above the flue. The brick has a decided tendency to throw the gases forward.



No. 3—The outstanding feature of this illustration is that the brick comes up almost to the centre of the flue—thus greatly restricting the passage of the gas. Also the bottom of the flue is slightly below the bottom edge of the canopy. The defect is the pocket above the flue.



No. 4—Section of the Davis new barless fire. It has a large well-shaped flue, situated well above the front edge of the canopy. The canopy has an ample cover in front of the burner-line at all points. There are no pockets, angles, or obstructions in the canopy chamber. The brick offers no restrictions to the passage of the flue.

Right and Wrong of Canopy Construction.

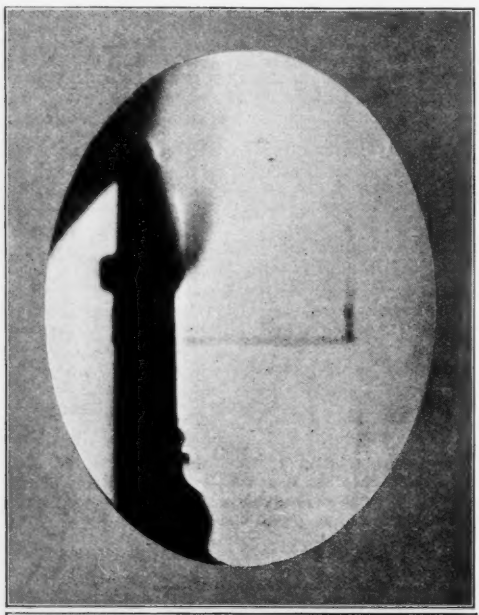
After having given an extended demonstration of the "Shadowgraph" method of testing, and much confirmatory evidence, an investigation was made of the conditions prevailing within the canopy chamber of a gas-fire of modern construction; and each point affecting the travel of the gases was carefully considered under two headings—those tending to the passage of the gases of combustion through the flue, and those militating against this result. A *résumé* of these investigations we will now give, in conjunction with diagrams Nos. 1, 2, 3, and 4 (p. 319).

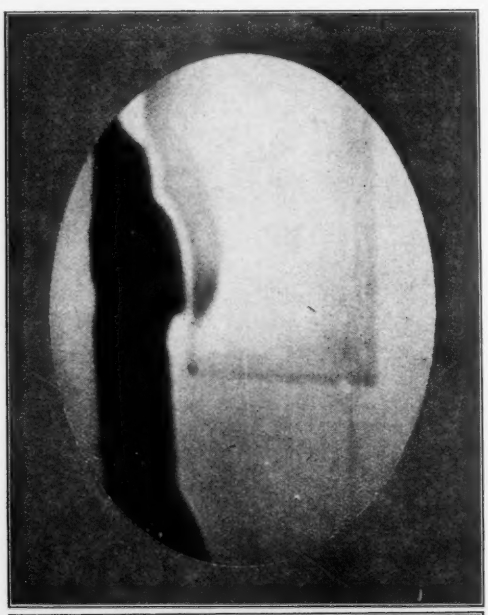
In the opinion of the Luton technical staff of the Davis Company, there are several very important features affecting the course taken by the gases of combustion, each one of which has been the subject of close investigation; numerous tests, of both a chemical and a physical nature, having been carried out, to ascertain the exact result of varying the construction under each heading. The practical and valuable issue is that last season the Davis Gas-Stove Company produced, in their new barless series of fires, a construction based upon the results of close scientific research; and it is their opinion, founded on extended tests, that these fires represent the most efficient and hygienic series ever placed upon the market.

Referring to diagram No. 1, which shows the sectional construction of a nondescript fire, it will be seen that the flue-outlet is large in area, and of the form which the Davis Company believe to be correct. But the centre of the flue-outlet is situated very little above the front edge of the canopy. This is considered a serious defect, as the height governs the natural draught set up in the canopy chamber. In this construction, they also consider another serious defect is that there is a large chamber situated above the top of the flue-outlet. This forms a pocket into which the gases will circulate, setting up eddy currents, and thus disturbing the natural passage of the gases to the flue. Another factor in a construction of this nature, which, it is contended, would tend slightly to cause bye-passing, is the formation of the brick. This, however, is not very pronounced in this particular instance. On referring to the sectional plan, it will also be seen that the canopy projects well in front of the burner-line at all points; and this is considered to be good practice.

Diagram No. 2 represents another form of construction. In this it will be seen that the flue-outlet is not only unduly small in area, but is circular in shape. As the result of their investigations, the Davis Company have entirely discarded circular flue-outlets for gas-fires. The whole of the evidence that they have obtained, they inform us, goes to prove that an oblong outlet is the only correct practice. In this fire, the centre of the flue is considerably higher than the front edge of the canopy, which would have the effect of producing a fair natural draught in the canopy chamber. But there is also a considerable pocket above this flue; and the brick is of such a nature that it will, they say, undoubtedly add greatly to the tendency of the gases to pass beneath the canopy. Reference to the plan will show that while the canopy projects well in front of the burner-line at the centre of the fire, the projection is greatly decreased at the sides, where, it is held, it should be, if anything, greater, owing to the fact that, in this construction, the gases from the end burners have a more tortuous path to pursue in finding their way to the flue-outlet. A fire constructed in this fashion would, investigation convinces the technical staff of the Company, unquestionably bye-pass a portion of its products beneath the canopy.

Diagram No. 3 is especially produced to illustrate what is regarded as a defective brick arrangement. In this illustration, it will be seen that the brick is carried up to the centre of the flue-outlet, which means that, if the bottom half of the flue is to be used, the gases have to take a downward course behind the brick; and as the bottom edge of this flue is actually below the front edge of the canopy, it is almost apparent, without recourse to actual test, that such a fire would bye-pass a considerable portion of its products beneath the canopy—there being practically no natural draught produced in the chimney, owing to the very faulty construction of the brick.





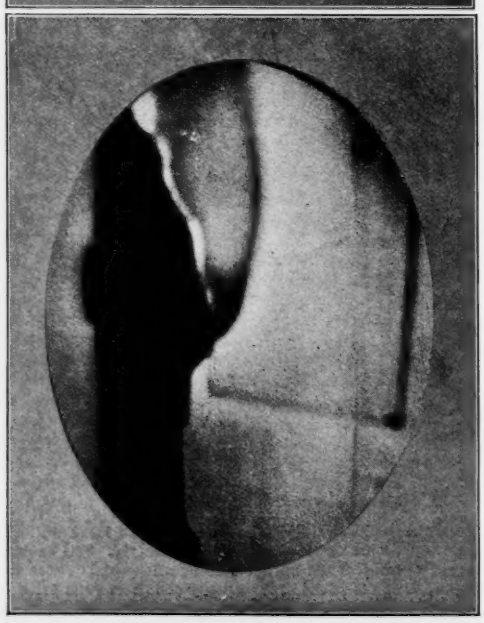


Diagram No. 4 shows an actual section of one of the fires of the "Davis" new barless series produced last season, from which it will be seen that the flue is (according to the principles laid down) of correct shape and ample size, and is so situated relative to the front edge of the canopy, that a good natural draft is produced within the chamber. It will also be observed that the top of the flue is the absolute top of the canopy chamber, and that anything in the form of a pocket-angle or sharp change in the direction of the gases is strictly avoided—gentle curves being used throughout. The brick, it will be remarked, offers no restriction whatever to the free travel of the products of combustion to the flue after leaving the refractory mantles situated over the burners. Another point worthy of consideration is the space allowed between the front edge of the canopy and the refractory mantles. This is carefully proportioned to allow a large volume of ventilated air to be drawn into the flue without in any way affecting the radiant efficiency of the fire. It will be seen that the air drawn from the front edge of the canopy into the flue will not in any way come into contact with the refractory material used as the main source of radiation. An examination of the sectional plan also shows that the canopy projects well in front of the burner-line at all points. Every one of these factors to hygienic efficiency has been carefully investigated; and this series of fires has been designed upon the results obtained from the research.

Some further reference to this series of fires will therefore be of interest. The patented construction of the fire is such, that the ornamental front can be readily removed; but it does not in any way affect the working of the fire, which is left intact—the canopy proper and the back being cast in one piece, thus avoiding all cement joints, which, in the Company's view, are liable to cause trouble at any time.

The fuel designed for the coming season also embodies some patented improvements, which will be described on a future occasion, and which are intended, and do, play an important part in conducting the heat to the main body of the fuel—thus raising its average temperature, and producing a uniformly incandescent appearance and greater radiant efficiency. Fires with the old and new forms of fuel, working side by side from the same gas supply, and at the same gas consumption, showed a striking difference in appearance, to the advantage of the new fuel. This new fuel (which will be supplied in the coming season) is interchangeable with that of last season. This is a point of much importance, and one that is receiving the careful attention of the Company.

Photographs of "Shadowgraph" Results.

Four representative illustrations are given of the results obtained by the Davis "Shadowgraphic" method of testing fires that are, under the conditions described, bye-passing beneath their canopies, a certain portion of the products of combustion.

Interest at Luton.

From this article it will be seen that, at the Luton works of the Davis Gas-Stove Company, there is something of particular technical interest to be seen; and any member of the gas-supply industry desiring to personally investigate for himself what we have endeavoured to describe as a result of a most interesting visit, will, we feel sure, be heartily welcomed by those in charge of the technical and commercial fortunes of the Company.

THE VALUE OF CO-OPERATION.

Progress of the Work of the British Commercial Gas Association.

We have received a batch of literature and pictorial work from the British Commercial Gas Association which has taken us longer to read and examine than it will do to write this article calling attention to it. The fact is the "Bulletin" for August, and the advertising circulars and pictures that have been prepared for purchase and circulation by the subscribers to the Association, have claimed our interest to such a degree that, when once reading commenced, we were impelled to proceed to the end. Take the "Bulletin" first, there is one observation that should particularly be made. It is this, that some of the notes by "F. W. G." (which we construe into F. W. Goodenough), and certain parts of the information furnished by the Editor (Mrs. M. A. Cloudesley Brereton) and the Secretary (Mr. W. M. Mason) ought to receive wider circulation than is obtained by restricting it to the "Bulletin," the larger part of the circulation of which is confined, we take it, to those who are already subscribers to the Association. The information that we have specially in view is highly encouraging to those who are already subscribers; and it will harden their judgment as to the utility of commercial co-operation. But the General and the Executive Committees of the Association want to have the scope and the opportunities of the organization enlarged by having the support of the whole gas-supply industry, and by affording the whole gas-supply industry the chance of reaping the benefits that accrue from co-operation. Co-operation is a wonderfully cumulative agency. As it expands, so the capacity for work and the effects increase. To confine facts to the "Bulletin" that will induce membership to the Association, seems to us to savour somewhat of the unprofitable practice of preaching to the converted.

Let us therefore give examples of these facts, and, by so doing, help to spread the tidings of a growing success, and of the fulfilment of objects. The information, we have no doubt, will assist to show non-subscribing undertakings that this is an organization outside the pale of which they cannot, in the interests of their concerns, afford to remain. In the article by "F.W.G.," we see that additional undertakings that at first did not give their adherence are gradually veering round, and the list of subscribers is accordingly extending. When the first number of the "Bulletin" was issued, the list recorded 222 undertakings supporting the Association; the list published in the present issue contains the names of 246 subscribers, "and the number is growing almost daily." This is indeed good news. The fact is one that should be spread aboard. The intelligence that further undertakings see value in the work of the Association to the industry as a whole will be the means of inducing other non-subscribing concerns to reconsider their position. Therefore such information should be as widely distributed as possible. We read on: "From all quarters come the welcome promises of support—from Scotland, from the North of England and the Manchester districts, from the Midlands, from Wales, from the Eastern Counties and from the Southern; while our latest adherent of all is from nigh the Land's End—Penzance. Some are companies, some are councils, some are boroughs. All are welcome, be they small, or be they great." We urge upon the consideration of those administrators of gas undertakings who are still of the non-adherents to consider whether, in face of this growth of membership, they ought not to come in to make the Association one of the strongest and most effective industrial and commercial organizations the country has ever seen.

The advertising literature that has been prepared by the staff of the organization has been examined. The Executive do not believe in so-called humorous pictorial display, so much patronized by our electrical friends, with the view of arresting attention; probably they favour the comic style because they themselves do not believe people will take them seriously. Artistic and daintily designed leaflets, with reading matter prepared in the bright and lucid manner that the layman can appreciate, is the line adopted by the British Commercial Gas Association. It will interest non-subscribers to learn the value attached by the subscribers to the first batch of literature issued. The orders already received for the various circulars noted in the catalogue total to some 320,000 copies. Such a variety of literature for circulation could only possibly be prepared by the aid of co-operation, except perhaps by the largest and most wealthy of undertakings, and then those undertakings would require special service to effectively carry through such a large amount of work. There, again, we have an instance of what co-operation can do in the way of the production of variety. The financial aspect is also well illustrated (referring to both pamphlets and posters) in a note, which we reproduce from the "Bulletin:"

> That enterprising undertaking, the Bournemouth Gas Company, being in need of a new booklet before the Association's publications were ready, employed artists, copy-writers, and printers on their own account to produce an edition of 5000 copies of a very effective illustrated book. This cost them over £13 per 1000 copies. The Association is taking over the publication from them, refunding the first cost, and will be able to supply subscribers with the quantities they require, however small, at somewhere about £4 or £5 per 1000 copies. Every undertaking that carries on local publicity work in anything like a thorough manner will very speedily recover the whole of its contribution to the Association in the reduced cost of its advertising matter; or will get very much better and more effective matter for the money it formerly spent. One has only to consider the case of a manager wanting a few posters or showcards. An order was recently received for 25 posters, for which our charge to the subscriber was 14s. 5d., *plus* carriage. The design of that poster cost of itself no less than £10 10s., and many posters cost three or four times that amount for the artist alone. The benefits of co-operation in publicity work are surely made so obvious by the consideration of these facts (even leaving out of account altogether the indirect benefits obtained through the general influence of the Association's advertisements in papers and publications of wide-spread circulation) as to need no further canvassing.

Enough has been quoted to show that the "Bulletin" contains information which indicates growth of the recognition of the value of co-operation. There is one other point in connection with which the organization has done work that could not possibly be, or rather is not likely to be, undertaken by any single gas undertaking. The art of advertising centres itself in attracting notice by means that will have a lasting impression. Pictures of high artistic merit for advertisement purposes cost money for the original drawing, and afterwards for the block necessary for printing. We have before us what is called the "Red Book" of the Association. It is a thick book, and contains numerous highly artistic prints of pictures, large and small, that advertise gas for many purposes—domestic, workroom, and street. The preparation of these pictures must have cost an amount of money that no single gas undertaking would at one time incur for such a purpose. Yet here are at hand an extensive range of blocks suitable for illustration work and for printing on all qualities of papers, and at moderate prices, considering the cost of obtaining the originals. From the pictorial standpoint, better illustrations could not be desired. From the point of view of suitability, there is no room for adverse criticism. And every one of the blocks for these pictures can be obtained as and when required by subscribers without any more trouble than is needed by the dictation of a letter, and remitting the modest price. The advertising columns of local papers need not be bare of attractive pictorial display by any gas undertaking that belongs to the Association. Then there is the "Blue Book," which contains details and prices of line

blocks; and the "Yellow Book," which presents suggested copy for use with the blocks in the Red and Blue Books.

Returning to the August "Bulletin." It embraces much that is informative. Among the contributors, in addition to those already noticed, are Mr. Reginald Sykes, Miss Helen Edden, Mr. H. W. Woodall, Mr. H. H. Creasey. Mr. Woodall in his article gives an account of "What We are Doing in Bournemouth." It is, in our opinion, the best number of the "Bulletin" that has yet been issued; and if its character is sustained at the present level (as it is intended it shall be sustained), it will be a useful and stimulating publication to all engaged in the gas commerce of the industry who are in a position to obtain a copy.

Regarding personal matters affecting the Association, we see from the "Bulletin" that Mr. Hanbury Thomas, the Managing-Director of the Sheffield United Gaslight Company, has been elected by his fellow Vice-Presidents to be one of the Representative Vice-Presidents of the General Committee in place of Mr. Corbet Woodall, who is now the President. To facilitate the work of the Finance Committee, the members have now been increased to seven, including the Chairman, by the addition of Mr. W. E. Price, of Hampton Wick.

REMOVING TAR AND CHLORIDE OF AMMONIA FROM GAS.

In the "JOURNAL" for Dec. 13, 1910 (p. 792), we gave an abstract of the specification of a patent obtained by MM. Solvay et Cie. for removing tar from coal gas. The firm have lately patented for France an arrangement for taking out the tar and the chloride of ammonia.

The patentees remark that by the employment of the plant forming the object of the former patent, in which the gas is washed by bubbling through tar, it is easy to separate the tar and then effect saturation of the ammonia by washing the tar-freed gas in sulphuric acid. This plant allows of different temperatures being kept in the various compartments; and by properly regulating them, a practically dehydrated tar can be obtained. This method of working, however, has the drawback that elimination of the ammonium chloride which condenses with the tar in variable quantity, involves special manipulations and gives imperfect results.

The present invention has been devised with a view to remedying the inconvenience named. It consists essentially in producing condensation of the ammonium chloride in the solid state before the gas is conveyed into the tar-separator. As this apparatus is supplied direct with tar already condensed in the hydraulic main, all condensation of ammonium chloride there must be avoided; and this can be done by removing the local causes of cooling. On the other hand, notwithstanding the large volume of gas to be treated, and the great vapour tension with ammonium chloride, measures must be adopted to prevent any portion of the latter being carried forward with the gas. It has been observed that, if the gas from the hydraulic main is cooled to a temperature of 180° to 120° C. (350° to 248° Fahr.), according to the percentage of chloride in the gas, a small quantity of the tar is deposited, and, owing probably to its vesicular condition, retains in it the particles of chloride. In order to avoid its condensation in the hydraulic main, all that is necessary is to effect its total condensation in the solid state in a suitable vessel placed between the main and the tar-separator. To facilitate the removal, by washing or otherwise, of the salt, two condensers can be employed, so arranged that it can be taken from one while the other is in use.

The general working of the process is as follows: The gas passes first through the hydraulic main, which is provided with a suitable covering to keep it at a sufficiently high temperature to prevent condensation of the chloride. It then enters a condenser, where its temperature is lowered to about that named above, and there gives up the ammonium chloride it contains. Thence it is conveyed to the tar-separator, and subsequently to the sulphuric acid saturator. The process not only allows of direct recovery of the chloride in a solid state, but also of the production of an anhydrous tar superior in quality to that ordinarily obtained.

Artesian Well in Westminster.—With the view of obtaining an independent water supply for the new building being erected for the Institution of Civil Engineers in Great George Street, an artesian tube well, 450 feet deep, commencing from the basement floor, 191 feet below the street level, has been bored. Before reaching the London clay, 17 ft. 6 in. of gravel and sand were passed through, so the alluvial soil extended down to 36 ft. 6 in. below the surface. The London clay proved to be 118 ft. 6 in. thick, beneath which there were 58 feet of Woolwich and Reading beds, and 27 ft. 10 in. of Thanet sand; making the depth at which the chalk formation was reached 228 ft. 10 in. from the basement floor. The boring penetrated 228 ft. 2 in. into the chalk. The water from the chalk, when struck, rose to within 174 feet of the basement, or 191 feet below Ordnance datum. It is calculated that the requirements of the building will be fully met by a pump raising 1000 gallons per hour; but it is stated that the pumping tests made showed that the well was capable of yielding double this quantity. The work, which was completed within seven weeks, was done by Messrs. Le Grand and Sutcliff, of Bunhill Row, E.C.

HOUSE-PIPING REGULATIONS IN NEW YORK.

The following rules and regulations in connection with the piping of houses and the provision of gas-fittings have been recently adopted by the officials of the five boroughs of Greater New York.

Before the construction or alteration of any gas piping in any building or part of a building, a permit must be obtained from the Superintendent of Buildings. This permit will be issued only to a registered plumber. Small alterations may be made by notifying the Bureau of Buildings. All gas-pipe shall be of the best quality wrought iron or steel, and of the kind classed as standard pipe, and shall weigh according to the following scale:

Diameter. Inches.	Weight per Linear Foot.	Diameter. Inches.	Weight per Linear Foot.
⅜	0·56 lb.	2	3·61 lbs.
½	0·85 ,,	2½	5·75 ,,
¾	1·12 lbs.	3	7·54 ,,
1	1·67 ,,	3½	9·00 ,,
1¼	2·24 ,,	4	10·66 ,,
1½	2·68 ,,		

No pipe allowed of less than ⅜ inch diameter.

All fittings (except stopcocks or valves) shall be of malleable iron. There shall be a heavy brass straightway cock or valve on the service-pipe immediately inside the front foundation wall. Iron cocks or valves are not permitted. Where it is not impracticable so to do, all risers shall be left not more than 5 feet from the front wall.

No pipe shall be laid so as to support any weight (except fixtures) or be subjected to any strain whatsoever. All pipe shall be properly laid and fastened to prevent becoming trapped, and shall be laid, when practicable, above timbers or beams instead of beneath them. Where running lines or branches cross beams, they must do so within 36 inches of the end of the beams; and in no case shall the pipes be let into the beams more than 2 inches in depth. Any pipe laid in a cold or damp place shall be properly dripped, protected, and painted with two coats of red lead and boiled oil or tarred. No gas-pipe shall be laid in cement or concrete unless the pipe or channel in which it is placed is well covered with tar.

All drops must be set plumb and securely fastened, each one having at least one solid strap. Drops and outlets less than ⅜ inch diameter shall not be left more than 1 inch below the plastering, centre-pieces, or woodwork. All outlets and risers shall be left capped until covered by fixtures.

No unions or running threads shall be permitted. Where necessary to cut out to repair leaks or make extensions, the pipe shall be again put together with right and left couplings. No gas-fitters' cement shall be used, except in putting fixtures together.

All gas brackets and fixtures shall be placed so that the burners are not less than 3 feet below any ceiling or woodwork, unless the same is properly protected by a shield, in which case the distance shall not be less than 18 inches. No swinging or folding gas-brackets shall be placed against any stud partition or woodwork. No gas-brackets on any lath-and-plaster partition or woodwork shall be less than 5 inches in length, measured from burner to plaster surface or woodwork.

Gas-lights placed near window curtains or any other combustible material shall be protected by a proper shield. Gas outlets for burners shall not be placed under tanks, at the back of doors, or within 4 feet of any meter. Outlets for gas-ranges shall have a diameter not less than is required for six burners, and all gas ranges and heaters shall have a straightway cock on the service-pipe.

When brass piping is used on the outside of plastering or woodwork, it shall be classed as fixtures. All brass tubing used for the arms and stems of fixtures shall be at least No. 18 standard gauge, and of full size outside, so as to cut a full thread.

All buildings shall be piped according to the following scale:

Diameter. Inches.	Length. Feet.	No. of Burners.	Diameter. Inches.	Length. Feet.	No. of Burners.
⅜	26	3	2	200	200
½	36	6	2½	300	300
¾	60	20	3	450	450
1	80	35	3½	500	600
1¼	110	60	3	600	750
1½	150	100			

All threads on brass pipe shall screw in at least 5-16ths inch. All rope or square tubing shall be brazed or soldered into fittings and distributors, or have a nipple brazed into the tubing. All cast fittings, such as cocks, swing joints, double centres, nozzles, &c., shall be of extra heavy brass. The plugs of all cocks must be ground to a smooth and true surface for their entire length, be free from sandholes, have not less than ¾ inch bearing (except in cases of special design), have two flat sides on the end for the washer, and have two nuts instead of a tail screw. All stop-pins to keys or cocks shall be screwed into place.

After all piping is fitted and fastened, and all outlets are capped up, there must be applied by the plumber, in the presence of an inspector of the Bureau of Buildings, a test with air to a pressure equal to a column of mercury 6 inches in height, and the same to stand for five minutes. Only a mercury gauge shall be used. No piping shall be covered up, nor shall any fixture, gas-heater, or range be connected thereto until a card showing the approval of this test has been issued by the Superintendent of Buildings.

No meter will be set by any gas company until a certificate is filed with them from the Bureau of Buildings certifying that the gas pipes and fixtures comply with the foregoing rules.

When for any reason it may be impracticable to comply strictly with the foregoing rules, the Superintendent of Buildings is to have power to modify their provisions so that the spirit and substance of them shall be complied with. These modifications are to be endorsed upon the permit over the signature of the Superintendent of Buildings.

COKE-OVEN GAS FOR TOWN PURPOSES.

By Arthur Douglas, B.Sc.

In recent articles the writer has discussed the possibility of the adoption of coke-oven methods for the recovery of ammonia in connection with ordinary gas-works practice. Side by side with this question is that of the use of coke-oven gas for town purposes; and although several writers have already dealt with this subject, there are certain phases which have received little if any attention in this country, and which are, in the opinion of the present writer, well worthy of consideration. There are many items in German coke-oven practice which are not at all well known here, and which, if properly understood and followed out, would put rather a different aspect on the possibility of the utilization of coke-oven gas. This question is very closely allied with that of carbonization in bulk in chamber-ovens, and reference is made below to a recent development of carbonization which brings the coke-oven more into line with the ordinary chamber-oven for gas making.

Perhaps the principal objection raised to the use of coke-oven gas is its varying composition and low illuminating power. In all coke-oven works a fair amount of air is drawn into the ovens and mixes with the gas, thus giving a larger amount of nitrogen in the resulting gas. Then, too, the coal as carbonized in coke-ovens contains about 10 to 15 per cent. of moisture; and this comes off with the gas during distillation. Practically the whole of this moisture, and also the air referred to above, come off with a small amount of gas during the first two or three hours of distillation. After that time, there is no moisture—except the usual water of distillation—and practically no air. It has been the practice in some cases where coke-oven gas has been utilized to take the whole of the gas evolved from one particular oven or charge, and consequently the gas obtained for the first two hours is of such a poor quality as to bring down condemnation of coke-oven gas in general.

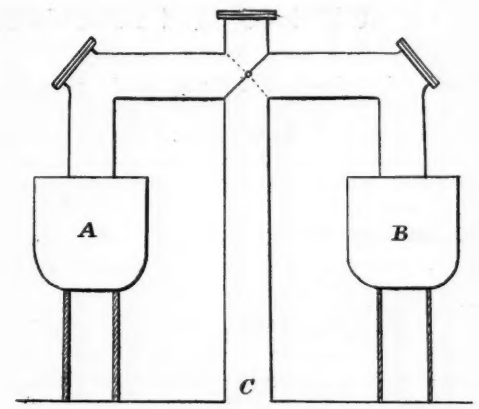
The writer has heard of such an instance where coke-oven gas was used, and as a result a "polite" notice was written in chalk on the office windows of the gas-works concerned (evidently by a disgusted consumer): "Your gas is all wind and stink, and is guaranteed not to burn." The protest was strong, and no doubt deserved. The obvious thing to do in utilizing coke-oven gas is to take the portion of it which is of fairly constant composition, and contains only the minimum of moisture and no air.

Investigations have been made by various workers; and it is found that when the period of carbonization of the coal is about 28 to 30 hours the gas evolved between the second and sixteenth hours is of fairly constant composition, and is almost, if not quite, as good as that produced in ordinary retorts. The writer has before him several analyses of the gas evolved during this period; and a typical one is given below, together with an analysis of the town gas supplied in the same district from retorts. It will be seen that there is very little difference in composition, and consequently in calorific value. The illuminating power was not tested, but was probably well over fourteen candles.

Coke Oven Gas. Per Cent.		Town Gas. Per Cent.	Coke Oven Gas. Per Cent.		Town Gas. Per Cent.
O_2 0·5	..	0·4	CH_4 31·4	..	34·7
C_nH_m 3·5	..	3·6	H_2 47·8	..	52·2
CO 7·8	..	4·2	N_2 9 0	..	4·9

In order to take off a portion of the gas from the coke-ovens a separate collecting main is necessary, as the ovens are not all charged at the same time, and consequently the gas evolved from one oven is not of the same composition as that from its neighbour. So that if only one main is used, the gas will be a mixture of good lighting gas and poor lighting gas; and the average of these will be such that the whole gas is rather below the necessary standard. In Germany various arrangements have been adopted, and one of the best is that shown herewith. This arrangement necessitates two gas collecting, or hydraulic, mains—one for the rich and one for the weak gas. To the top of the ascension pipe is attached a two-way valve, by means of which the gas issuing from the oven can be diverted at will into either main. During the first two hours the gas is turned into (say) the main A, and then for the next ten or twelve hours into the main B, and finally again into the main A until the whole of the charge is carbonized.

In a modern coke-oven, the coal carbonized yields about 10,000 or 11,000 cubic feet of gas. Of this, approximately half is required for heating the ovens; and it is for this purpose that the poor gas diverted into the main A is used. The remaining 5000 cubic feet of rich gas is used for illuminating purposes; and it is the experience of many installations in Germany that this gas is quite suitable in every way for all purposes for which town gas is usually employed. An additional benefit of having two mains is that two distinct qualities of tar are obtained. That deposited in the main A contains much water, while that deposited in the main B is a rich tar containing much less moisture, and hence is more desirable from many points of view. If such an arrangement as that described were adopted in this country, the writer is of opinion that many of the objections to this method of utilization would be overcome, and much of the gas which is at present wasted, or, at any rate, not used to the best advantage, would be turned to profitable account.



A. Collecting Main for Poor Gas. B. Collecting Main for Rich Gas. C. Gas from Oven.

Owing to the fact that by this method there are two lots of gas to be dealt with, it will be necessary to have a duplicate bye-product plant, so that the tar and ammonia will be recovered from each lot of gas separately. This would, of course, involve a little more capital outlay on the coke-oven plant; but it must also be taken into account that the extra ammonia recovery plant so used would do away with the necessity for using the scrubbers generally employed on gas-works, as well as with a large part of the apparatus for distilling the ammoniacal liquor. There are several works in Germany where such an arrangement as is described above is in successful operation, and the ammonia is recovered by the direct process. This latter fact bears out what the writer had to say in previous articles with regard to the adoption of the direct process on gas-works.

On many coke-oven plants benzol is also recovered from the crude gas; but, of course, this would not be done when the gas was used for town purposes, except in the case of the portion which was used for heating the ovens.

If the utilization of coke-oven gas is a profitable proposition, the natural development of the matter is the possibility of using the whole of the gas evolved for town purposes and employing producer gas as the medium for providing the heat necessary for carbonization. In the latter case, some modification of the conditions of carbonization would be necessary so as to produce the whole of the gas of fairly constant composition and calorific value, as a gas subject to large fluctuations in quality would certainly be very unsuitable for general use.

As a matter of fact, this development has already taken place; and the writer has been given to understand that the principle of coke-oven carbonization is applied in both the Munich and Koppers chamber ovens for the production of lighting gas. In the case of the latter system, an outside producer plant is used; and from all accounts which have appeared in English and German papers it seems to have worked quite satisfactorily. A still later development was fully described recently in the German Press—viz., the Koppers compound oven. This is a chamber-oven which can be used at will either as a coke-oven or as a gas-oven. In the former case, part of the gas evolved is used for heating the ovens, and only the air necessary for combustion is preheated in the regenerators. In the latter case, the whole of the gas evolved can be used for town purposes; and the ovens are then heated by means of producer gas.

It is undeniable that enormous waste of gas is going on in this country, and, moreover, a waste which is not taking place in Germany. The gas is available at a cheap rate, and there is ample scope for someone to come forward and solve the problem of its most satisfactory utilization.

Sterilizing Water by Ultra-Violet Rays.—The purification of water by ultra-violet rays is receiving the attention of both scientists and inventors in France. After proving by numerous laboratory tests that even the most virulent microbes can be readily destroyed by the rays produced by a quartz mercury vapour lamp, the next step was to devise small sterilizers for household use or for buildings, and then construct apparatus of large size. One of the most recent types for municipal service—the invention of M. Billon-Daguerre—was illustrated recently in "Engineering Record." It consists of a cylindrical riveted steel tank provided with double walls. The water enters the tank at one end, which has a gate valve sewer to regulate the flow. Four mercury vapour lamps, made with quartz tubes, are spaced regularly along the length of the cylinder, so that the water is sterilized by the action of the rays as it flows continuously through the tank. Each of the lamps is hung from a support; this being tightly bolted to a flanged head at the top of the tank. In order to direct the water close round the lamps, so that the rays will act at the shortest range and upon a thin layer of water, guides are used in the shape of perforated cylinders surrounding the lamps. The pressure of the water in the tank is about 110 to 140 lbs. The apparatus is designed to give a steady output of 22,000 gallons per hour, and can be run without stopping. The lamps are connected to the electric lighting mains as they work at 110 volts.

OXIDE OF IRON PURIFICATION IN SULPHATE OF AMMONIA WORKS.

As mentioned at the close of the extract from the report of the Chief Inspector under the Alkali Works Regulation Act (Mr. W. S. Curphey) given in the "JOURNAL" last week, p. 250, the results of the various experiments described were recorded in a series of tables. These we now reproduce, with the remarks upon them. There are four in the series (A to D); and, for convenience of reference, the experiments are numbered I. to XVII.

TABLE A.—EFFECT OF TEMPERATURE. SULPHIDING STAGE. AIR "ABSENT."

In this series, the reacting mixture approximates in composition to the waste gases from the sulphate of ammonia saturators as recorded in the annual report for 1905 if we admit hydrocyanic acid as being present in trifling amount when gas-works liquor is distilled. The average composition of the reacting mixture is given at the head of each series of sulphiding experiments. Below these figures will be found the rates of flow calculated in c.c. per minute at 0° C. and 760 mm. for total mixed gases, and H_2S present therein. A comparison of the figures for rates of flow of H_2S for each series affords a measure of the "rate of fouling" in each case. Compared with the rate of flow of waste gases through a sulphate of ammonia purifier, the speed is enormously greater in the tube experiments. Thus—

A typical English gas liquor would contain, per 100 parts of liquor, 2·5 parts of $NH_3 = 10$ of $(NH_4)_2SO_4$; 0·5 of H_2S; 2·3 of CO_2; or 10 lbs. of sulphate of ammonia, 0·5 lb. H_2S, and 2·3 lbs. of $CO_2 = 5{\cdot}26$ cubic feet H_2S and 18·7 cubic feet CO_2 (at 0° C. and 760 mm.) per 10 gallons. Whence 1 ton of sulphate would yield —$5{\cdot}26 \times 224 = 1180$ cubic feet of H_2S. $18{\cdot}70 \times 224 = 4190$ cubic

TABLE A.—*Action of Sulphuretted Hydrogen on Oxide of Iron in Presence of CO_2 and "Absence" of Air. (Effect of Temperature.)*

	Sulphuretted Hydrogen Absorbed. Calculated as Sulphur. Grammes.				Sulphuretted Hydrogen. Grammes.			
	For first Sulphiding, 9 Grammes of Hydrated Oxide, containing 23·5 per Cent. Moisture (= 6·875 Grammes Dry).				For first Sulphiding, 6·875 Grammes of Oxide, dried at 100° C.			
	Temperature of Oxide during Sulphiding.				Temperature of Oxide during Sulphiding.			
	30° C.	55° C.	70° C.	90° C.	60° C.	85° C.	100° C.	125° C.
	After each Sulphiding and Re-oxidation, Oxide Re-dried before each subsequent Sulphiding at				After each Sulphiding and Re-oxidation, Oxide Re-dried before each subsequent Sulphiding at			
	25° C.	25° C.	25° C.	25° C.	100° C.	100° C.	100° C.	100° C.
Expt. No.	**I.**	**II.**	**III.**	**IV.**	**V.**	**VI.**	**VII.**	**VIII.**
Average composition of gas . . CO_2	68·2	67·2	66·1	62·0	75·0	66·2	63·5	63·4
H_2S	30·7	31·8	32·7	36·6	24·0	32·0	35·1	35·1
Air	1·1	1·0	1·2	1·4	1·4	1·8	1·4	1·5
Rate of flow, c.c. per minute at 0° C—								
Total gas	30·0	33·4	35·5	23·7	32·5	28·1	28·8	25·0
H_2S therein	9·2	10·6	11·6	8·7	7·8	9·0	10·1	8·8
First sulphiding, sulphur absorbed . .	1·745	1·850	1·830	1·804	1·312	1·587	1·621	1·615
Second sulphiding " " . .	1·681	1·590	1·423	1·086	0·556	1·103	1·161	0·457
								Ammonia water used to assist revivification.
Third sulphiding " " . .	1·585	1·490	1·249	0·800	0·368	0·830	1·089	0·803
Fourth sulphiding " " . .	1·472	1·535	1·094	0·643	..	..	1·003	0·882
Fifth sulphiding " " . .	1·324	..	..	..	..	..	0·795	..
Total . . .	7·807	6·465	5·596	4·333	2·236	..	5·669	3·757
Free sulphur extracted by CS_2—								
Weight . . . . . grammes	7·180	5·951	5·069	3·721	0·800	..	4·734	1·187
Per cent. in dried oxide	50·0	45·5	42·5	34·0	25·0	..	40·0	11·0
Per cent. of total H_2S entering—								
Recovered as free sulphur . . .	92·0	92·0	90·5	86·0	80·5	..	83·5	31·5
Other forms (by difference) . . .	8·0	8·0	9·5	14·0	19·5	..	16·5	68·5
SO_2 evolved during sulphiding, grammes	..	..	..	..	..	Trace.	Trace.	Trace.
Re-sulphided after extraction of sulphur	..	1·832	1·348	0·688	..	First sulphiding Second sulphiding	0·621 0·915 (NH_3 used).	0·826
						Third sulphiding	1·756 (re-dried 25° C.) (sulphided 55° C.)	
Characteristics of products—								
1.—Sulphide	Wets easily. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Wets easily. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Wets easily. Acid to litmus. Decided trace of soluble Fe_2. Oxidizes readily.	Wets slowly. Acid to litmus. Decided trace of soluble Fe_2. Oxidizes readily.	Wets easily. Acid to litmus. .. Oxidizes readily.	Wets slowly. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Wets easily. Acid to litmus. Neutral to methyl orange. Much soluble Fe_2. Oxidizes rather slowly. (Incipient "souring.")	Wets easily. Acid to litmus. Neutral to methyl orange. Much soluble Fe_2. No soluble Fe_2. "Sour" after second sulphiding; ammonia used to assist re-oxidation.
2.—Revivified product—								
Dried in air at 40° C.	Neutral to litmus. No soluble Fe_2 or Fe_3.	Neutral to litmus. No soluble Fe_2 or Fe_3.	Neutral to litmus. No soluble Fe_2.	Neutral to litmus. No soluble Fe_2.	.. ..	Neutral to litmus. No soluble Fe_2 or Fe_3.	Slightly acid to methyl orange. Much soluble Fe_2. No soluble Fe_3.	.. .. ..
Dried in air at 100° C. . . .	..	..	..	Evolves trace of So_2. Acid to methyl orange. Ferrous sulphate and ferric sulphate formed.	..	..	No SO_2 evolved. Slightly acid to methyl orange. Ferrous sulphate formed, and trace of ferric sulphate.	The ammonia neutralized product on drying yielded decided traces of ferrous and ferric sulphates, and became acid to methyl orange.

feet of $CO_2 = 5370$ cubic feet total gases. Such a mixture would contain per 100 volumes of $CO_2 = 78$, $H_2S = 22$.

Assuming that the purifier had an area of 250 square feet of oxide with a depth of 2 feet per ton of sulphate of ammonia made per 24 hours, the volume of oxide would equal 500 cubic feet. Each cubic foot of oxide would receive per hour—

$$H_2S = \frac{1180}{500 \times 24} = 0{\cdot}1 \text{ cubic foot.}$$

$$\text{Total gas} = \frac{5370}{500 \times 24} = 0{\cdot}45 \text{ cubic foot.}$$

Each square foot of oxide would receive per hour—

$$H_2S = \frac{1180}{250 \times 24} = 0{\cdot}2 \text{ cubic foot.}$$

$$\text{Total gas} = \frac{5370}{250 \times 24} = 0{\cdot}9$$

In the tube experiments, the respective rates, calculated per square foot and cubic foot, would be—

H_2S per hour per cubic foot oxide = 48·8 cubic feet
H_2S per hour per square foot oxide = 12·8

while the period of contact of the H_2S in the purifier would be 500 times as great as in the case of the tube.

The calculation in the case of the sulphate of ammonia purifier is, of course, based on the assumption that the whole body of oxide would be operative during the sulphiding process. In practice, this would not be the case; the gas would saturate each layer of oxide before passing to the next, so that the action would be local and correspondingly more intense. One cubic foot of oxide weighing 50 lbs. and containing 25 lbs. of Fe_2O_3 is theoretically capable of absorbing (102 × 25) ÷ 160 = 16 lbs. of sulphuretted hydrogen = 16 ÷ 0·095 = 168 cubic feet at 0° C. and 760 mm. Therefore 7 cubic feet of such oxide would theoretically absorb the whole of the sulphuretted hydrogen evolved in the manufacture of a ton of sulphate of ammonia, assuming the reaction to be complete. The local calorific effect must therefore be great, and the rise of temperature considerable, unless abundant moisture is present to moderate the intensity of reaction. In the tube experiments, the rise of temperature during the sulphiding process was very marked, in spite of the cooling effect of the water-jacket; the temperature of the oxide exceeding that of the bath by 5° to 6° C. during the middle of the experiment. When air was present, the excess temperature in the tube over that of the bath on occasions exceeded 40° C.

Considering the results in Table A in detail, it will be seen that there is a progressive fall in the yield of free sulphur and a corresponding rise in the "sulphur in other forms" with rise of temperature. Thus, at 25° C. (Experiment No. I.), 92 per cent. of free sulphur and 8 per cent. of other forms; at 125° C. (Experiment No. VIII.), 31·5 per cent. of free sulphur and 68·5 per cent. of other forms.

Sulphided at a temperature not exceeding 90° C., the product obtained oxidized readily, and contained only a small amount of soluble iron; while the oxidized product obtained therefrom on revivification and drying at 40° C. was neutral to litmus, and contained no iron compounds soluble in water.

At 100° C., the product of sulphiding contained much ferrous sulphate. It oxidized rather slowly, and the oxidized product was slightly acid to methyl orange, and contained much soluble iron. Incipient "souring" was noticeable. At 125° C., the sulphide obtained during the second sulphiding was quite inert, and contained a large amount of ferrous sulphate. Revivification could only be effected with the aid of an alkali such as ammonia water. The sulphide was "sour."

The effect of the added ammonia in bringing ferrous sulphate into the hydrated condition is illustrated by the results obtained in

TABLE B.—*Action of Sulphuretted Hydrogen on Oxide of Iron in presence of Carbon Dioxide and Air. (Effect of Temperature.)*

—	Sulphuretted Hydrogen Absorbed, Calculated as Sulphur. Grammes.				
	Hydrated Oxide. 9 grammes (23·5 per Cent. Moisture).	Oxide Dried at 100° C.; 6·875 grammes (9 grammes moist).			
	Oxide Sulphided at.	Oxide Sulphided at			
	55° C.	95° C.		115° C.	135° C.
	Revivified Oxide Re-dried before Use at 25° C.	Revivified Oxide Re-dried before Use at 100° C.			
Expt. No.	**IX.**	**X.**	**XI.**	**XII.**	**XIII.**
Average composition of gas, CO_2	37·1	34·7	33·0	30·7	31·9
H_2S	22·4	22·8	24·2	24·0	22·8
Air	40·5	42·5	42·8	45·3	45·3
Rate of flow, c.c. per min. at 0° C.—					
Total gas	35·2	34·0	30 6	30·8	33·4
H_2S therein	7·9	7·8	7·4	7·4	7·6
First sulphiding	4·577	3·641	2·900	4·014	4·520
Second ,,	3·243	1·780	2·664	2·099	2·084
Total	7·820	5·421	5·564	6·113	6 604
Free sulphur extracted by CS_2—					
Weight . . . grammes	7·558	4·975	5·062	4·479	5·108
Per cent. in dried oxide	52·0	41·0	41·0	36·5	..
Per cent. of total H_2S entering—					
Recovered as free sulphur	96·5	92·0	91·0	73·5	77·5
As other forms (by difference)	3·5	8·0	9·0	26·5	22·5
SO_2 evolved during sulphiding grammes	nil	Trace	nil	0·05	0·09
Resulphided after extraction of sulphur	..	2·587	..	..	..
Characteristics of products—					
1.—Sulphide	A little caked above. Wets easily. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Caked above. Wets easily. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Caked above. Wets rather slowly. Acid to litmus. Trace of soluble Fe_2. Oxidizes readily.	Caked above. Wets easily. Acid to litmus. Neutral to methyl orange. Decided trace of soluble Fe_2. Oxidizes readily.	A little caked above. Wets slowly. Acid to litmus. Neutral to methyl orange. Much soluble Fe_2. Oxidizes slowly. Ammonia water used to promote oxidation (Incipient 'souring').
2.—Revivified product. Dried in air at 40° C.	Brown. Neutral to litmus. No soluble Fe_2.	Brown. Neutral to litmus. Trace of soluble Fe_2.	Brown. Neutral to litmus. No soluble Fe_2. No SO_2 evolved.	Rather dark brown. Acid to methyl orange. Slight trace of soluble Fe_2. No soluble Fe_2. No SO_2 evolved.	Dark brown. Acid to methyl orange. Decided trace of soluble Fe_2. Trace of soluble Fe_2. No SO_2 evolved.
Dried in air at 100° C.	..	..	Acid to methyl orange. Trace of soluble Fe_2. No soluble Fe_2. SO_2 evolved.	Acid to methyl orange. Much soluble Fe_2. Trace of soluble Fe_2. SO_2 evolved.	Acid to methyl orange. Much soluble Fe_2. Trace of soluble Fe_2. SO_2 evolved. Neutralized with ammonia and again heated. Acid, Fe_2, Fe_2 reappear.

the second and third sulphidings (Experiment No. VIII., 125° C.). Second sulphiding, 0·457 gramme H_2S absorbed calculated as sulphur; third sulphiding, 0·803 gramme H_2S absorbed, calculated as sulphur (NH_3 water used). A progressive fall in the amount of sulphuretted hydrogen absorbed during successive sulphidings (apart from any special circumstances) is noticeable in all the experiments.

TABLE B.—EFFECT OF TEMPERATURE. AIR PRESENT.

In this series of experiments, the proportion of air present in the reacting gases was adjusted so as to be approximately twice the amount of sulphuretted hydrogen present. For exact oxidation, 2½ times the volume would be necessary. The whole of the oxygen present is never operative; but oxidation must proceed at a great rate. Analysis of the exit gases in one experiment showed that when the sulphiding had proceeded two-thirds of the way down the tube, the oxygen was almost completely absorbed, notwithstanding the rapid rate of flow—20 to 30 c.c. of gas per minute. Thus (Experiment No. X.), 95° C., with 42·5 per cent. of air in the reacting mixture, the exit gases contained less than 0·3 per cent. of oxygen.

When air is used, SO_2 begins to make its appearance at higher temperatures (Experiments Nos. XII., XIII.). This is attributed mainly to the action of oxygen on FeS_2. The addition of air to the gas had an unexpected effect. It largely increased the yield of "free sulphur," and caused a corresponding decrease in the amount of sulphur present in other forms. The temperature at which "souring" commenced was raised from 100° C. to 135° C.; the amount of ferrous sulphate was markedly reduced at all temperatures.

In one experiment (No. XI.), the reacting gases before entering the tube were passed through a U-tube containing water at 70° C. to moisten the gases, but without effect upon the yield of free sulphur. By this means, 0·726 gramme of water was introduced into the tube in excess of that usually present in the undried gases.

It is noticeable that when the revivified products obtained in the sulphiding experiments above 95° C. are damped and dried again at 100° C., free acid and soluble salts of iron are formed. Treatment with ammonia removes these; but a further production takes place if the process of drying is repeated. This is true even if the free sulphur be removed by extraction with carbon bisulphide; SO_2, also, is evolved on simply heating the oxide to a temperature of 80° C. to 90° C. in air. This behaviour is consistent with the presence of FeS_2 as a reaction product.

TABLE C.—COMPARISON OF RESULTS. AIR "ABSENT" AND PRESENT.

In this table are brought together for purposes of comparison various selected results from Tables A and B. In one case the average of two experiments (Nos. X., XI.) is given. The beneficial effect of air in increasing the efficiency of the oxide, both in respect to the weight of sulphur absorbed and the yield of free sulphur, is apparent.

TABLE D.—EFFECT OF HYDRATION. AIR "ABSENT."

These results are of especial significance. They prove that the efficiency of the oxide is controlled in a marked degree by the amount of moisture present. Thus (Experiment No. XIV., 30° C.)—

	Sulphur Absorbed.
Third sulphiding, oxide dried at 100° C. before use	0·372 gms.
Fourth sulphiding, ,, ,, 25° C. ,,	1·592 ,,

See also Nos. XV. to XVII., where the revivified product was divided into two halves, each of which was sulphided separately at the same temperature (55° C.), but with different amounts of moisture present, the oxide dried at 25° C., and presumably in a higher state of hydration, invariably absorbing a greater weight of sulphuretted hydrogen.

The gradual fall in efficiency as sulphiding proceeds is characteristic of sulphiding at all temperatures. At low temperatures the fall appears to be due, at least in part, to the presence of separated sulphur. Thus (Table A, Experiment No. II.)—

	Sulphur Absorbed.
First sulphiding	1·850 gms.
Fourth sulphiding	1·535 ,,
After extraction of sulphur by CS_2	1·832 ,,

At higher temperatures, the efficiency is not restored by extraction of free sulphur; other factors operate. Thus (Table A, Experiment No. IV.; sulphided at 90° C.)—

	Sulphur Absorbed.
First sulphiding; oxide before use dried at 25° C.	1·804 gms.
Fourth sulphiding; oxide before use dried at 25° C.	0·643 ,,
After extraction of free sulphur by CS_2; dried at 25° C.	0·688 ,,

The full efficiency is restored, however, if the revivified oxide is dried at 25° C. and sulphided at 55° C. Thus (Table D, Experiment No. VI.)—

	Sulphur Absorbed.
Fourth sulphiding—	
Oxide dried at 100° C., sulphided at 55° C.	0·488 gms.
Oxide dried at 25° C., sulphided at 55° C.	1·688 ,,
First sulphiding	1·587 ,,

There appears, therefore, to be an intimate connection between the degree of moisture present in the oxide and its efficiency as an absorber of sulphuretted hydrogen at temperatures below 100° C.

TABLE C.—*Action of Sulphuretted Hydrogen on Oxide of Iron in Presence of Carbon Dioxide. (Effect of Air.)*

Conditions.	Hydrated Oxide, 9 Grammes (= 6·875 Grammes Dry).	Oxide Dried at 100° C. 6·875 Grammes.			
	Sulphided at	Sulphided at			
	55° C.	95° to 100° C.	115° C.	125° C.	135° C.
Expt. No.	**II.**	**VII.**	..	**VIII.**	..
1.—"Absence" of Air.					
Composition of gas, CO_2	67·2	63·5	..	63·4	..
H_2S	31·8	35·1	..	35·1	..
Air	1·0	1·4	..	1·5	..
Rate of flow, c.c. per minute, at 0° C.—					
Total gas	33·4	28·1	..	25·0	..
H_2S therein	10·6	10·1	..	8·8	..
H_2S absorbed—					
Total weight (grammes)	6·465	5·669	..	3·757	..
Average weight absorbed during each sulphiding (,,)	1·616	1·132	..	0·939	..
Sulphur recovered—					
Free sulphur (per cent.)	92·0	83·5	..	31·5	..
Other forms (by difference) (,,)	8·0	16·5	..	68·5	..
SO_2 evolved during sulphiding (grammes)	..	Trace	..	Trace	..
Properties of sulphide	Oxidizes readily.	Oxidizes partially and slowly (incipient "souring").	..	Inert ("sour").	..
Expt. No.	**IX.**	**X., XI.**	**XII.**	..	**XIII.**
2.—Presence of Air.					
Composition of gas, CO_2	37·1	33·8	30·7	..	31·9
H_2S	22·4	23·6	24·0	..	22·8
Air	40·5	42·6	45·3	..	45·3
Rate of flow, c.c. per minute at 0°C.—					
Total gas	35·2	32·2	30·8	..	33·3
H_2S therein	7·9	7·6	7·4	..	7·6
H_2S absorbed—					
Total weight (grammes)	7·82	5·492	6·113	..	6·604
Average weight absorbed during each sulphiding (,,)	3·91	2·746	3·056	..	3·302
Sulphur recovered—					
Free sulphur (per cent.)	96·5	91·5	73·5	..	77·5
Other forms (by difference) (,,)	3·5	8·5	26·5	..	22·5
SO_2 evolved during sulphiding (grammes)	Nil	Trace	·050	..	·090
Properties of sulphide	Oxidizes readily.	Oxidizes readily.	Oxidizes fairly rapidly.	..	Oxidizes partially and slowly (incipient "souring").

Possibly the amount of moisture present determines the degree of hydration of the oxide; removal of water causing a change in the character of the hydrate prejudicial to its activity, Such change of state appears to be reversible.

At higher temperatures, the efficiency of the oxide is interfered with by the formation of soluble salts of iron and an increasing amount of disulphide. Gedel states that FeS_2 is intractable and inactive towards air. This view is contrary to experience. It is a well-known fact that white pyrites, finely divided yellow pyrites, or FeS_2 prepared in the wet way, on exposure to air oxidize to ferrous sulphate, and at higher temperatures yield SO_2 and Fe_2O_3. [See "Watts's Dictionary," Vol. III., p. 64.] The behaviour of the oxidized products obtained at higher temperatures in these experiments clearly indicates that FeS_2 is formed during the sulphiding stage, and that on continued exposure to heated air in the moist condition ferrous sulphate is generated, accompanied by free SO_2 in greater or less amount. It is the presence of ferrous sulphate and disulphide that appears to confer upon the high-temperature products the peculiar properties that are associated with the description "sour." Oxide of iron, after conversion into these bodies, is inert towards sulphuretted hydrogen. On exposure to air, the disulphide is slowly oxidized to ferrous sulphate, and revivification therefore may lead to an accumulation in the mass of oxidized products useless for purification purposes. On treatment with alkali, the ferrous sulphate is converted into ferrous hydrate, and ultimately into hydrated peroxide; but the disulphide remains unaffected. Further exposed to air, ferrous sulphate is again generated; and this continues until the disulphide is wholly oxidized. Repeated treatment with alkali followed by exposure to air may, in some cases, be necessary before an oxide is wholly restored to healthy condition.

At lower temperatures, the amount of disulphide formed is relatively small; and during exposure to warm air in presence of moisture it is doubtless oxidized, at least in part, to basic sulphates insoluble in water, and not wholly inert towards sulphuretted hydrogen.

With respect to the presence of ferrous sulphate formed during the sulphiding stage at all temperatures, and especially at temperatures above 100° C., this body would appear to be formed, at least in part, by interaction of oxide of iron with one or other of the sulphides present. It is significant that the presence of air is unfavourable to the formation of ferrous sulphate at all temperatures when excess of sulphuretted hydrogen is present.

Such are the conclusions reached with respect to the results obtained in the laboratory and here summarized. Following the explanation offered by L. Gedel of the reactions that occur under similar conditions existing in the research conducted by him, the equations given below are submitted as explanatory of the sulphiding and the oxidation stages in sulphate of ammonia works purifiers:—

ACTION OF SULPHURETTED HYDROGEN ON OXIDE OF IRON.

[CONDITIONS SLIGHTLY ACID THROUGHOUT.]

Sulphiding Stage.

1.—$Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O$.
2.—$Fe_2O_3 + 3H_2S = 2FeS + 3H_2O + S$.
3.—$FeS + S = FeS_2$.
4.—Interaction, in part, of Fe_2O_3 with Fe_2S_3, FeS, or FeS_2 to form $FeSO_4$.

Oxidation Stage.

1.—$Fe_2S_3 + 3O = Fe_2O_3 + 3S$.
2.—$2FeS + 3O = Fe_2O_3 + 2S$.
3.—Interaction of FeS_2 with oxygen to form $FeSO_4$ and SO_2. Interaction of SO_2, air, and moisture in contact with hydrated oxide of iron to form free sulphuric acid and ferric sulphate.
4.—Interaction of $FeSO_4$ with hydrated oxide and air to form basic sulphates insoluble in water.

If we accept Gedel's conclusions with respect to the specific effect induced by the presence of traces of ammonia in the reacting gases, we should look for "souring" in works where conditions of working favoured absence of ammonia in the waste gases, and where the temperature of the oxide was high enough to favour the formation of ferrous sulphate and disulphide.

The temperature most favourable for the maximum absorption

TABLE D.—*Action of Sulphuretted Hydrogen on Oxide of Iron in Presence of Carbon Dioxide and "Absence" of Air. (Effect of Hydration.)*

—	Sulphuretted Hydrogen Absorbed, Calculated as Sulphur, Grammes.									
	Temperature of Oxide during Sulphiding.									
	55° C.	30° C.	85° C.	55° C.						
				Oxide Dried at 100° C., 6·875 Grammes.						
	Hydrated Oxide, 9 Grammes (= 6·875 Grammes Dried).	Oxide Dried at 100° C., 6·875 Grammes.	Revivified Oxide before Use Dried at 100° C.	Revivified Oxide Used in this Experiment Obtained from the Fifth Sulphiding, Expt. No. VI., Dried at 25° C. and Divided.		Revivified Oxide Used in this Experiment Obtained from the Sixth Sulphiding, Expt. No. XV., Dried at 100° C. and Divided.		Revivified Oxide Used in this Experiment Obtained from the Seventh Sulphiding, Expt. No. XVI., Dried at 25° C., Mixed with 1 Gramme $CaCO_3$ and Divided.	
	Revivified Oxide before Use Dried at 25° C.	Revivified Oxide before Use Dried at 100° C.		One-Half (= 3·438 Oxide) Used as Dried at 25° C.	One-Half (= 3·438 Oxide) Further Dried at 100° C.	One-Half (= 3·438 Oxide) Re-wetted and Dried at 25° C.	One-Half (= 3·438 Oxide) Used as Dried at 100° C.	One-Half (= 3·438 Oxide) Used as Dried at 25° C.	One-Half (= 3·438 Oxide) Further Dried at 100° C.
Expt. No.	**II.**	**XIV.**	**VI.**	**XV.**		**XVI.**		**XVII.**	
Average composition of gas—									
CO_2	67·2	69·6	66·2	61·6		62·7		64·5	
H_2S	31·8	29·0	32·0	37·2		36·2		34·1	
Air	1·0	1·4	1·8	1·2		1·1		1·4	
Rate of flow, c.c. per min. 0° C.—									
Total gas	33·4	22·1	28·1	23·9	20·7	29·2	23·0	28·0	16·2
H_2S therein	10·6	6·4	9·0	8·9	7·7	10·5	8·3	9·5	5·5
First sulphiding	1·850	1·774	1·587	..	..	..	..	..	..
Second sulphiding	1·590	0·360	1·103	..	..	..	..	..	..
Third sulphiding	1·490	0 372	0·830	..	..	..	..	..	..
		Revivified Oxide Dried at							
		25° C. before Fourth and Fifth Sulphidings at 30° C.	100° C. before Fourth Sulphiding at 55° C.						
Fourth sulphiding	1·535	1·592	0·488	..	..	..	..	..	..
			Revivified Oxide Dried at 25° C. before Fifth Sulphiding at 55° C.						
Fifth sulphiding	..	1·630	1·688	..	..	..	..	..	..
Sixth sulphiding	..	..	..	0·822	0·270	..	..	..	..
Seventh sulphiding	..	..	..	..	..	0·828	0·327	..	..
Eighth sulphiding	..	..	..	..	..	..	..	0·861	0·320

of sulphuretted hydrogen and the maximum yield of free sulphur both in presence and "absence" of air would appear to lie in the neighbourhood of 60° C. It is interesting that calculation shows that at 63° C. the volume of residual gases obtained when a gaseous mixture containing 30 per cent. of CO_2, 20 per cent. of H_2S, and 50 per cent. of air, reacts with oxide of iron to form free sulphur, is just able to carry the water vapour produced by the reaction. The hydration conditions of the oxide would then be undisturbed by the chemical reactions, as the moisture generated would be removed by the residual gases, and there would be neither addition to, nor loss of water from, the mass.

Works Tests.

Temperature Records of the Working of Oxide Purifiers with Revivification "in situ."

Through the courtesy of the managers, I am enabled to present the results of temperature records taken at two sets of purifiers working with revivification *in situ*. The experiments at the New Southgate Gas-Works, under the charge of Mr. John Mitchell, were conducted by my Assistant, Mr. Linder. They are incomplete, and must be regarded as preliminary only. The experiments at the Dundee Gas-Works were carried out by the works staff, acting under direction of the Engineer and Manager, Mr. Alexander Yuill. The results obtained at these works form a very valuable record of the actual working of the purifiers from day to day under skilled supervision; and thanks are due to those whose industry has enabled me to present so complete a series of tests.

I.—*Temperature of Oxide in Purifiers at the New Southgate Gas-Works.*

There are two brick purifiers built side by side, with a dividing wall between them. Each purifier is 9 ft. 6 in. square (inside), with one layer of oxide 18 inches deep. By means of a water change-valve, the saturator gases can be sent into either purifier at will, together with a small amount of air supplied under pressure from a blowing-engine. The purifiers are worked alternately. During each period of rest, air is blown through to revivify the oxide *in situ*. The oxide used consists in part of virgin oxide freshly charged, together with a proportion of partially spent material from the gas-works purifiers. The virgin oxide used during the tests was that employed for the tube experiments previously described. Temperature readings were obtained by inserting 3-feet thermometers in the oxide at different points and to various depths. The results are presented in Tables E, F, and G.

In the case of No. 1 purifier (Table E), the oxide when treated was nearly spent. Distribution of gas was very imperfect, and there was much back-pressure on the plant, which is reflected in the tests. Thus the temperature on the grid at the centre at 1.55 p.m. showed 91° C.; at a point on the grid 2 feet from the side, 66° C.; at a point 1 foot from the side, 42° C. A sample of the fouled oxide taken from the purifier at 3 p.m. and extracted with water gave a solution neutral to methyl orange; traces of ferrous sulphate only were present, and the solution was without action on iodine. The neutral condition of the sulphide and comparative freedom from ferrous sulphate is of interest in view of the facts previously discussed. It is possible, also, that the presence of ammonia in the saturator gases assisted in preserving the oxide.

Table F contains the results of similar tests made on No. 2 purifier, containing oxide in the same conditions. Here again there is evidence of imperfect distribution. The highest temperature recorded was 98° C.

The results in Table G were obtained under improved conditions of working. No. 1 purifier was freshly charged with one-half virgin oxide and one-half revivified oxide from the gas-works purifiers, and the distributing grids were replaced. The recorded temperatures indicate that distribution was satisfactory, and that the mass was sulphiding steadily from below upwards. The highest temperature recorded was 64° C.—a figure which may be compared with the maximum reading at Dundee Gas-Works in Mr. Yuill's experiments—55° C.

The results generally indicate that the purifiers were unequal to the work put upon them during the conditions prevailing in the tests. This conclusion is confirmed by a consideration of the volume of gases dealt with, calculated from an analysis of the liquor. During the experiments, the make of sulphate of ammonia per 24 hours was 2½ tons. This quantity, with the strength of liquor used, would evolve 2620 cubic feet of H_2S per 24 hours at 0° C. The volume of oxide in each purifier was approximately 135 cubic feet = 90 ft. by 1 ft. 6 in. deep. Whence: H_2S dealt with per hour per cubic foot of oxide = 0·8 cubic foot; do. per square foot of oxide = 1·2 cubic feet. For plant working under normal conditions, the corresponding figures would be: H_2S per hour per cubic foot of oxide = 0·1 cubic foot; do. per square foot of oxide = 0·2 cubic foot. It is interesting that "souring" trouble is unknown at these works.

II.—*Data from the Dundee Gas-Works.*

The following data have been kindly supplied to me by Mr. Yuill, and, with the results of the analysis of an average sample of the gas liquor used, I am enabled to calculate the "rate of

Table E.—*Temperature of Oxide in No. 1 Purifier (Sulphiding Stage).*

[Grids Removed. Distribution Imperfect.]

Time.	Saturator Gases Entering.				Temperature of Oxide, Deg. C.							Remarks.
	Temperature. Deg. C.	Per 100 Volumes.			Centre of Purifier. (A)				Two Feet from Side. (B)		One Foot from Side. (C)	
		CO_2.	H_2S.	Residual.	On Grid.	3 In. Up.	6 In. Up.	Surface.	On Grid.	3 In. Up.	On Grid.	
July 10, 1911.												
12.0 midnight	Purifier changed over from aëration to sulphiding stage. A little air admitted with the gas.											Dimensions of oxide bed— Area 9 ft. 6 in. × 9 ft. 6 in. = 90·2 square feet. Volume = 90·2 × 1 ft. 6 in. = 135 cubic feet. Weight of oxide = 2 tons 15 cwt. (calculated).
July 11, 1911.												
12.15 p.m.	32	77·7	22·0	0·3	..	..	..	..	..	..	..	
1.5 ,,	..	..	..	..	75	..	..	..	70	..	..	
1.10 ,,	..	..	..	..	79	..	..	..	..	..	..	
1.37 ,,	..	..	..	..	86	..	..	..	..	..	42	
1.45 ,,	..	..	..	..	90	..	..	..	70	..	..	
1.55 ,,	..	..	..	..	91	87	..	..	66	..	42	
2.5 ,,	35	..	..	..	..	89	75	69	67	69	..	
2.35 ,,	..	77·9	21·8	0·3	..	..	78	..	..	70	..	
2.52 ,,	..	..	..	..	..	..	81	..	..	71	..	

Table F.—*Temperature of Oxide in No. 2 Purifier (Oxidation and Sulphiding Stages).*

[Grids Removed. Distribution Imperfect.]

Time.	Temperature of Oxide on the Grid, Deg. C.			Remarks.
	At Centre of Purifier. (A)	Two Feet from Side. (B)	One Foot from Side. (C)	
July 10, 1911.				
12.0 midnight	Purifier changed over from sulphiding to the aëration stage.			Air admitted through 1-inch pipe.
July 11, 1911.				
11.45 a.m.	74	62	..	
11.52 ,,	78	67	..	
12.8 p.m.	79	69	28	
12.52 ,,	..	69	28	
1.5 ,,	..	..	27	
3.0 ,,	Purifier changed over from aëration to sulphiding stage.			No air admitted with the gas.
3.5 ,,	92	53	..	Composition of gas, per 100 vols.—
3.10 ,,	95	60	..	CO_2 . . . . . 77·9
3.13 ,,	96 (on grid) 40 (at surface)	62 (on grid) 33 (at surface)	..	H_2S . . . . . 21·8
4.0 ,,	98	70	..	Residual . . . . . 0·3

fouling" of the oxide in the purifiers during the series of temperature readings which are represented graphically.

The purifiers consist of a rectangular box in four compartments, each with separate gas-pipe, and capable of being worked independently. It is usual to work the sections alternately—two sections receiving gas on alternate days, the remaining two standing to revivify by exposure to air. The area of each section is 30 ft. by 14 ft. 6 in., or 435 square feet, with a depth of 15 inches, equal to 544 cubic feet, and it holds 10 tons of oxide.

The quantity of sulphate of ammonia made per day was 80 cwt., or 373 lbs. per hour. Whence the "rate of fouling" of the oxide in the working section of the purifier, as measured by hundredweights of sulphate of ammonia per cubic yard of oxide per 24 hours, was $80 \div 20 = 4$, or per square yard of oxide $80 \div 48{\cdot}3 = 1{\cdot}6$.

A more accurate measure of the "rate of fouling" is given by the number of cubic feet of H_2S entering the purifier per cubic yard of oxide per hour. It is calculated thus: By analysis, 100 lbs. of the gas liquor used contain total $NH_3 = 1{\cdot}3$ lbs. $= 5{\cdot}2$ lbs. $(NH_4)_2SO_4$; $H_2S = 0{\cdot}138$ lb. $= 0{\cdot}138 \times 1 \div 0{\cdot}095 = 1{\cdot}45$ cubic feet; $CO_2 = 1{\cdot}4$ lbs. $= 1{\cdot}4 \times 1 \div 0{\cdot}1227 = 11{\cdot}4$ cubic feet; HCy, nil. Whence the saturator gases contain per 100 volumes: CO_2, 88·7; H_2S, 11·3. And the total volume of H_2S per 373 lbs. of sulphate of ammonia per hour = 104 cubic feet at 0° C. and 760 mm. Whence the rate of fouling, in cubic feet of H_2S per cubic yard of oxide per hour, is $104 \div 20 = 5{\cdot}2$.

Mr. Yuill found by actual analysis of the saturator gases, after admixture with air admitted both at the inlet to the still and at the purifier, using the iodine method previously described: CO_2, 76·5; H_2S, 10; O, 2·8; N, 10·7. Whence, excluding air, CO_2, 88·4, and H_2S, 11·6.

The temperature records are represented graphically on the following diagrams (p. 331):

(1) *Temperature of Oxide in Section A.*—Purifier working continuously for five days with limited admission of air, then allowed to cool seven days without admission of either gas or air. Oxide then well spent and would contain over 40 per cent. of sulphur.

(2) *Temperature of Oxide in Section B.*—Purifier working continuously for nine days with a limited admission of air, then allowed to cool for nine days. Oxide then well spent, and would contain upwards of 40 per cent. of sulphur. Section A was then rested four weeks, and revivified by the action of the atmosphere only. It was then used for the test recorded on Diagram 3. Section B was similarly rested and revivified three weeks, and was then used for the test recorded on Diagram 4. In no case was fresh oxide added to any of the sections during the observations.

In Diagrams 3 and 4, the two sections were worked alternately, each section receiving gas for 24 hours, then resting 24 hours to revivify by exposure to air, and cool. Temperature records in every case were taken by three 3-feet thermometers, placed in the centre of the section about 3 inches apart—one thermometer with its bulb resting on the grid, the second 6 inches up, the third 9 inches up. This enabled the rate of sulphiding of each layer of oxide to be studied. The temperature of the gases at the purifier inlet was in every case about 15·5° C.

Mr. Yuill has furnished me with the following particulars relating to the working of his coal-gas purifiers: Four purifiers, all working at one time, each holding 100 tons of oxide, and each 40 ft. by 30 ft. by 4 ft. 6 in.; oxide = 5400 cubic feet = 200 cubic yards. Area 40 ft. by 30 ft. = 1200 square feet = 133 square yards. The rate of flow into the first purifier would be 2500 cubic feet per minute, or 150,000 cubic feet per hour. H_2S in the crude coal gas is 1 per cent., or 1500 cubic feet per hour.

The "rate of fouling," assuming all the H_2S was absorbed in the first purifier, would be the number of cubic feet entering per cubic yard of oxide per hour—*i.e.*, $1500 \div 200 = 7{\cdot}5$. The "rate of fouling" calculated for the whole bulk of oxide receiving gas would be $1500 \div 800 = 1{\cdot}9$. These results may be compared with those already given. The temperature of the crude coal gas entering the first purifier was 15·5° C. (60° Fahr.), and on leaving it 25·5° C. (75° to 80° Fahr.)—a difference of 10° C.

III.—*Data Supplied as to Sulphate of Ammonia Practice.*

Through the courtesy of managers, I have received detailed statements respecting the working of sulphate of ammonia plant in various parts of the country. It was hoped that careful comparison of the practice followed at works where "souring" was rare with that followed at works where it was chronic would assist in elucidating the conditions controlling the formation of "sour" oxide. Eliminating certain factors—such as efficiency of condensing plant, sulphur content of oxide, &c.—the data were considered under four subheads: (1) Character of oxide, natural or artificial. (2) Form of purifiers, and oxide content in relation to sulphate of ammonia made. (3) Method of work; purifiers and the make of sulphate of ammonia. (4) "Rate of fouling," as measured by certain factors.

Figures relating to twelve typical works in which gas liquor is distilled are given in Tables H and I; the former containing data relating to English practice, where "souring" is of very rare occurrence, and the latter containing similar data relating to Scotch practice, where "souring" is of frequent occurrence in many works. The results are tabulated separately, because the general character of Scotch liquors differs markedly from that of English liquors. Thus, comparing typical liquors we find:

	Scotch.		English.
Total NH_3, grammes per 100 c.c.	1·500	..	2·500
CO_2 " " "	1·700	..	2·300
H_2S.	0·075	..	0·510
Whence the saturator gases per 100 vols. are—			
CO_2.	95	..	78
H_2S.	5	..	22

In comparing one works with another, a rough test of the efficiency of the purifiers is afforded by the factor "rate of fouling," as measured by the number of cubic feet of sulphuretted hydrogen absorbed in the working purifier per cubic yard of oxide per hour. A high figure for "rate of fouling" denotes that sulphuretted hydrogen is being absorbed far too rapidly for safety. As an

TABLE G.—*Temperature of Oxide in No. 1 Purifier (Sulphiding Stage).*

[GRIDS REPLACED. DISTRIBUTION EFFICIENT.]

Time.	Saturator Gases Entering.				Temperature of Oxide on Grid, Deg. C.						Remarks.
	Temperature. Deg. C.	Per 100 Volumes.			At Centre of Oxide.	At Side of Oxide.	At Corner of Oxide.				
		CO_2.	H_2S.	Residual.	(A)	(C)	1.	2.	3.	4.	
July 12, 1911.	Sulphiding stage, a little air admitted with the gas.										
11.40 a.m.	Before start.	..	..		22 (on grid).	22 (on grid).	..	..	..	..	Purifier freshly charged with one-half virgin oxide and one-half oxide from gas-works purifiers. For analysis of virgin oxide, see *ante*. 3 p.m., air shut off. 6 p.m., air turned on again.
11.45 "	32 Started.	..	..		22 (at surface).	22 (at surface).					
12.40 p.m.	..	79·5	20·2	·3	23	22	..	..	..	..	
2.40 "	..	77·3	22·4	·3	26	26	..	..	..	..	
3.40 "	..	..	..	..	35	30	..	..	..	..	
3.50 "	36	..	..	..	46	..	42	40 (on grid). 24 (at surface).	..	33	
July 13, 1911.											
8.30 a.m.	..	..	..	..	46	..	..	..	..	..	
9.30 "	..	..	..	..	..	51	..	..	..	..	
11.0 "	..	..	..	..	48	52	..	..	..	..	
12.8 p.m.	..	..	..	..	48 (6 in. up).	59 (6 in. up)	..	..	..	..	
12.50 "	26	82·4	17·3	·3	..	..	45	57	..	..	
1.50 "	..	..	..	..	..	..	45 (on grid). 56 (6 in. up). 56 (9 in. up).	59 (on grid). 64 (6 in. up). 57 (9 in. up).	44 (on grid). 49 (6 in. up). ..	..	
2.45 "	..	..	..	..	51	..	..	..	..	54	
3.45 "	..	..	..	..	54 (on grid). 62 (6 in. up). — (9 in. up).	..	..	..	..	52 (on grid). — (6 in. up). 61 (9 in. up).	
July 14, 1911.											
3.0 a.m.	Plant stopped.	..	..		53	..	..	..	..	56	

example, it was found at Works A, Table H (rate 21 cub. ft. H_2S per cubic yard of oxide per hour), that the temperature of the oxide rose to over 90° C., and the escape of sulphuretted hydrogen was only prevented by frequent attention. At Works A, Table I (rate 5·2 cubic feet of H_2S per cubic yard of oxide per hour), the maximum temperature reached was only 55° C.—a temperature well suited for active reaction; and no trouble was experienced with respect to escape of gas.

It is interesting to find that, though conditions of working in sulphate of ammonia purifiers differ widely from those in coal-gas purifiers, the "rates of fouling" are not widely different. Exact comparison is, of course, out of the question, as practice varies

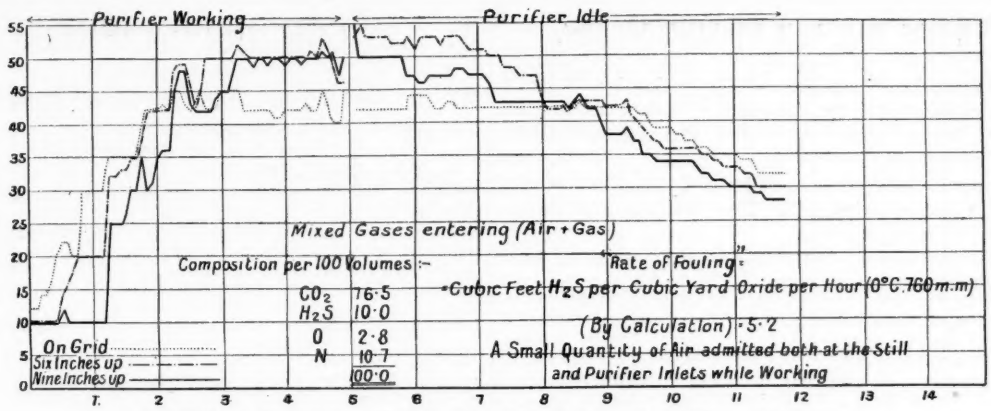
TABLE H.—*Sulphate of Ammonia Purifiers.* (*English Practice.*)

—	Oxide Revivified on Floor.			Oxide Revivified *in situ*.	
	Works A.	Works B.	Works C.	Works D.	Works E.
Character of oxide	Natural, charged half fresh with half revivified, from gas-works purifiers.	Natural, charged fresh together with partially spent oxide (25 per cent. S) from gas-works purifiers.	Dutch, charged fresh.	Natural, used after partial fouling in gas-works purifiers (20 per cent. sawdust).	Artificial, charged fresh with possibly some old.
Purifiers—					
Form	2 walled, unroofed	2 walled, roofed	2 walled, roofed	2 walled, unroofed	1 walled, roofed
Weight of oxide in working purifier . tons	2¾	31	24	25	20
Area of ditto . . . . . sq. feet	90	420	188	241	147
Depth of ditto . . . . . inches	18	36 (in two layers)	66 (in two layers)	54	32
Volume of ditto . . . . . cub. feet	135	1260	1034	1084	440
" " . . . . . cub. yds.	5	46·7	38·3	40·2	16·3
Volume of oxide in working purifiers per ton of sulphate made per 24 hours . cub. ft.	54	420	647	600	220
Gas liquor used—					
Total NH_3, grammes per 100 c.c. . . .	2·790	2·440	2·380	2·540	1·495
H_2S " " "	0·496	0·350	0·536	0·566	0·259
Method of work—					
How used	Purifiers worked singly and alternately; changed over every 12 hours, with air injection during both periods.	Purifiers worked each box singly until the oxide is spent; a clean box is then put on.	Worked singly and alternately; changed over every 200 hours.	Worked singly; changed over every 12 hours. Idle box revivified by chimney draught air drawn downwards through oxide.	Aërated once a week *in situ* by injecting air and steam from Saturday to Monday.
Weight of sulphate of ammonia made—					
Per working hour . . . . . lbs.	233	280	150	168	186
Per 24 hours . . . . . cwt.	50	60	32	36	40
"Rate of fouling" (as measured by)—					
Cwt. of sulphate made per cubic yard of oxide per 24 hours.	10	1·3	0·8	0·9	2·4
Do. per square yard per 24 hours	5	1·3	1·5	1·3	2·4
Cubic feet H_2S per cubic yard of oxide per hour	21	2·3	2·3	2·4	5·2

TABLE I.—*Sulphate of Ammonia Purifiers.* (*Scotch Practice.*)

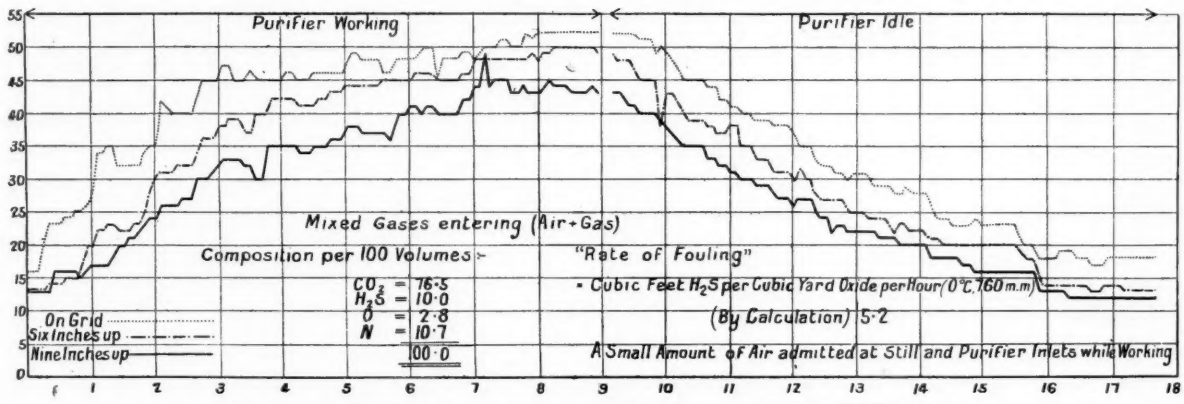
[In Works A^1 to C^1, comparative absence of "souring;" in Works D^1 to F^1, chronic "souring."]

—	Oxide Revivified, *in Situ*.		Oxide Revivified on Floor.	Oxide Revivified, *in Situ*.		Oxide Revivified, on Floor.
	Works A^1.	Works B^1.	Works C^1.	Works D^1.	Works E^1.	Works F^1.
Character of oxide	Dutch (4 parts). Artificial (1 part). Lux (1 part). From coal-gas purifiers (40 p. ct. S.)	Belgian bog ore.	Dutch.	Irish bog ore, charged fresh, with addition of some old oxide.	Natural, used after partial fouling in gas purifiers (45 p. ct. S.)	Dutch bog ore.
Purifiers—						
Form	Four boxes, walled and roofed.	One walled	Two heaps, with low retaining wall.	Two, walled and roofed.	Two heaps, low broad base, unroofed.	One walled, unroofed.
Weight of oxide in working purifier . . . . . tons	10	6¾	50	15	24	13
Area of ditto . . . . sq. feet	435	324	600	270	288	272
Depth of ditto . . . . inches	15	9	36	24	..	18
Volume of ditto . . . cub. feet	544	243	1500	540	840	408
" " . . . cub. yds.	20	9	55·6	20	31	15·1
Volume of oxide in working purifier per ton of sulphate made per 24 hours . . . . . cub. feet	136	120	884	315	560	136
Gas liquor used—						
Total NH_3, grammes per 100 c.c.	1·300	2·400	1·083	1·940	0·96	1·977
H_2S	0·138	0·303	0·095	0·187	0·05	0·255
Method of Work—						
How used	Worked singly on alternate days. Air in limited quantity admitted with the waste gases.	10 hours' work, followed by 14 hours' rest, with air injection during each period.	Worked singly, Each purifier receives gas until back-pressure is evident; then it is laid off for rest.	Worked singly. Changed every 24 hours. Air pumped into idle purifier.	Worked singly. First heap receives gas until foul; it then rests while gas enters second. Air is injected at bottom of still.	16 hours' work, followed by 8 hours' rest. When fouled, refilled with fresh oxide.
Weight of sulphate of ammonia made—						
Per working hour . . . lbs.	373	190	152	160	140	280
Per 24 hours . . . . . cwt.	80	40·7	33·9	34·3	30	60
"Rate of Fouling" (as measured by)—						
Cwt. of sulphate made per cubic yard of oxide per 24 hours . .	4·0	4·5	0·6	1·7	1·0	4·0
Do., per square yard per 24 hours	1·6	1·1	0·5	1·1	..	2·0
Cubic feet H_2S per cubic yard of oxide per hour	5·2	7·0	0·7	2·0	0·6	5·5
"Souring," how prevented or cured	Oxide sprayed with water once a fortnight to remove acid compounds.	..	..	..	..	..


Purifier Working
Purifier Idle
Mixed Gases entering (Air + Gas)
Composition per 100 Volumes :-
CO2 76·5
H2S 10·0
O 2·8
N 10·7
100·0
"Rate of Fouling"
Cubic Feet H2S per Cubic Yard Oxide per Hour (0°C. 760 m.m)
(By Calculation) 5·2
A Small Quantity of Air admitted both at the Still and Purifier Inlets while Working
On Grid
Six Inches up
Nine Inches up

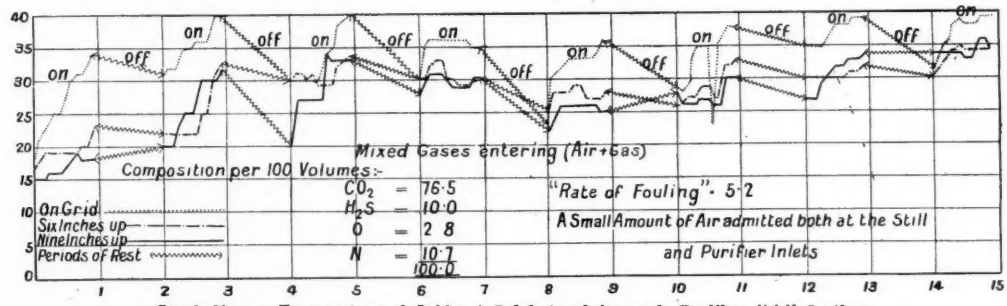
Graph No. 1.—Temperature of Oxide at Sulphate of Ammonia Purifier—"A" Section.

Section worked continuously five days; then gas shut off and allowed to cool seven days. Volume of oxide, 30 feet × 14 feet, 6 inches × 15 inches deep = 544 cubic feet.


Purifier Working
Purifier Idle
Mixed Gases entering (Air+Gas)
Composition per 100 Volumes :-
CO2 = 76·5
H2S = 10·0
O = 2·8
N = 10·7
100·0
"Rate of Fouling"
Cubic Feet H2S per Cubic Yard Oxide per Hour (0°C. 760 m.m)
(By Calculation) 5·2
A Small Amount of Air admitted at Still and Purifier Inlets while Working
On Grid
Six Inches up
Nine Inches up

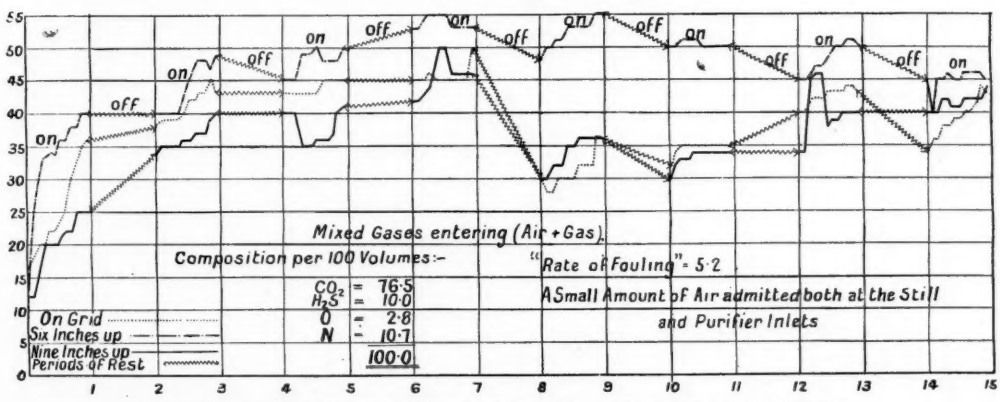
Graph No. 2.—Temperature of Oxide at Sulphate of Ammonia Purifier— "B" Section.

Continuous run eighteen days, nine on gas—nine idle. Volume of oxide, 30 feet × 14 feet, 6 inches × 15 inches deep = 544 cubic feet.



Graph No. 3.—Temperature of Oxide at Sulphate of Ammonia Purifier—"A" Section.

Worked alternately with "B" Section (Graph No. 4) 24 hours on, 24 hours off. Volume of Oxide, 30 feet × 14 feet, 6 inches × 15 inches deep = 544 cubic feet.



Graph No. 4.—Temperature of Oxide at Sulphate of Ammonia Purifier—"B" Section.

Worked alternately with "A" Section (Graph No. 3) 24 hours on, 24 hours off. Volume of oxide, 30 feet × 14 feet, 6 inches × 15 inches deep = 544 cubic feet.

too widely in works of both classes. The following calculation is submitted as applicable to average working conditions. The data are based upon figures supplied by Mr. Lewis T. Wright, in his article, on "Coal Gas," in Thorpe's "Dictionary of Applied Chemistry:" Volume of crude coal gas per 24 hours, 2,500,000 cubic feet, containing 1·5 per cent. H_2S = 37,500 cubic feet per day = 1560 cubic feet per hour. Eight purifying vessels, each 30 ft. by 30 ft., with three layers of oxide 9 inches each; cubic contents = 75 cubic yards per vessel. Assume six purifiers working, there would be 450 cubic yards of oxide. Then the "rate of fouling" will be 1560 ÷ 450 = 3·5 cubic feet H_2S per hour per cubic yard of oxide—a figure which may be compared with the 5·2 cubic feet, the rate of fouling at Works A[1] in Table I, where concurrent revivification is practised.

WATER-GAS TAR FOR KILLING WEEDS.

We learn from the last number of "Progressive Age" to hand that the Conestoga Traction Company, of Lancaster (Pa.), of which Mr. C. Edgar Titzel is the General Manager, have lately been using to excellent advantage on their roadway water-gas tar for the purpose of killing the weeds, laying the dust, and beautifying the track, 162 miles in length. The following particulars are furnished by our contemporary.

The Lancaster Gaslight and Fuel Company—an allied concern, operated under the same management—make water gas, and until last year the tar was only used for burning under the boilers. When employed in this way, it necessitated the constant repair of the boilers; so after a time it was decided to stop using it for this purpose, and to try to find a better market for it. Shortly afterwards, some experiments were made with the tar; the entire yard at the works (the weeds in which it took considerable labour to keep down) being sprinkled with it, as well as the street in front of the Gas Company's property. The tar was found to lay the dust fairly well, and to effectually kill the weeds. It was put on in July last year, and since then not a single weed has made its appearance.

This fact was brought to the attention of Mr. H. W. Crawford, the Engineer of the Traction Company; and shortly after a small tank and sprinkler were fitted on a truck, and the sprinkling the track was begun. It was soon found to work so well that a tank-car holding 1000 gallons was constructed, and preparations were made to oil the entire roadway. Shortly afterwards another car was secured, so that the Company now have two sprinkler-cars, and are prepared to carry on the work to excellent advantage.

The tar, which is stored in the gas-works relief holder, is pumped into a small tank, and from this through a 2-inch line for about 600 feet to the tank-car, which is placed on the trolley siding situated on the works property. The car is simply a small tank about 4 feet in diameter and 15 feet long, placed on an old truck. At one end a 2-inch hole is tapped in the bottom, and connected up by a 2-inch line with the sprinkler. A plug stop is placed in the line, so that the tar can be turned on and off.

The sprinkler is a piece of 2-inch iron pipe capped at either end, and just the width of a tie. It is supported by two adjustable rods, which regulate the distance of the sprinkler above the rail, and is attached to the outlet of the tank by a 2-inch hose. On the bottom of the pipe, for use as the sprinkler, are three rows of 3-16th inch holes staggered, so that when the tar is turned on it throws a constant and uniform stream across the entire track. The part of the sprinkler directly above the rail is blank, to prevent any tar from getting on the rail. A 2-inch wire flue brush is fastened to a ⅜-inch pipe, and this is run through the sprinkler at intervals so as to clear out the leaves and other refuse which collect and tend to stop up the holes. The tank-cars cost about $100 each; the tank, holding 1000 gallons, being purchased for $68, and old wheels and lumber being used in the construction of the trucks.

The Gas Company had about 200,000 gallons of the tar in stock; so that the Traction Company have been enabled to oil practically their entire roadway. The tar is sold to the Company for 2 c. per gallon, just as it comes from the relief holder—very little trouble having been experienced with water. The tank-car is drawn by a motor-car with three men—motorman, conductor, and brakeman; the conductor and brakeman acting as oilers, while the sprinkling is being done.

It has been found to take a little less than 3000 gallons of tar per mile of track; the total cost of the tar as applied being about $60 to $65 per mile of track. There are a number of stretches of track on which the tar was applied last year; and this year, in spite of many and heavy rains, the weeds have failed to make their appearance. A good deal of the track is alongside the turnpikes, which are much-travelled and very dusty, and so it has had a very severe test.

Previously it took a number of men in the summer to do nothing but pull weeds; and it is practically impossible to keep the weeds down in this way without spending an unwarranted sum of money. The tar, in addition to absolutely killing the weeds, is also believed to lengthen the life of the ties, though this cannot be definitely stated until more time has elapsed. The tar carries with it a slight odour of gas; but this soon passes off, and is in nowise objectionable.

It is estimated that this oiling of the track will cause considerable saving in the maintenance of the way, and at the same time keep it in much better shape than heretofore. It is believed that one application of the tar will last for two years, and that after several applications the bed of the road will be so saturated that the growth of weeds will be stopped for a considerable time.

There is no reason why trolley companies and gas companies cannot be mutually benefited by the use of tar for this purpose—the former securing a first-class weed-killer, and the latter a profitable market for their bye-product. It will be profitable, because the tar can be sold in this way without any preparation whatever.

The Truro Rural District Council have accepted the tender of Mr. W. E. Bennett, in the sum of £2770, for the construction of waterworks at Perranporth.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Great Grimsby Gas Company.

Sir,—I am a holder of stock and shares in the Great Grimsby Gas Company. The Company's capital consists of stock entitled to a maximum dividend of 10 per cent., and fully-paid £10 shares entitled to dividends regulated by the sliding-scale. The price charged for gas has for several half years past been such as to entitle the £10 shares to receive dividends at the rate of 10½ per cent.; and the statements of accounts for that period show that the Company's profits have been amply sufficient to provide such dividends. But, while the stock has been receiving its full statutory dividends, the shares have only received dividends less by ½ per cent. than those to which they are entitled.

Having held a number of these shares since 1886 (the year of issue), awaiting the realization of the prospect then held out to subscribers, of a possibility of dividends improving in course of time under the sliding-scale, I wrote last January to the Company's Secretaries suggesting that perhaps the Board of Directors might take the matter into their consideration prior to the declaration of the next dividend. Up to the present date, I have not been so fortunate as to elicit any actual information on the subject.

The protracted correspondence between myself and the Secretaries is so remarkable that I venture to enclose you a *précis* thereof, as an illustration of one way of exercising the gentle art of snubbing a shareholder. Possibly other holders of these £10 shares have been similarly treated. I should be glad to hear from them, if so, and if you will permit communication thereon to be addressed to you.

July 25, 1912. PERTINAX.

[Enclosure.]

1912.

Jan. 17. I wrote the Secretaries pointing out that the new shares alone were receiving less than their statutory dividend, and expressing hope that the Board would see their way to recommending the full rate for the current half year.

Feb. 2. Letter from Secretaries stating that the course taken by the Board had been considered by the Auditors and had had the "opinion" of Counsel—on the strength of which opinion the Board had acted.

Feb. 13. I wrote inquiring whether I might be allowed to peruse the "opinion."

Feb. 29. Not having received reply, I wrote again.

March 5. Letter from Secretaries stating that the Board did not see their way to allowing me to see the "case" or the "opinion." The resolution as to the dividend was confirmed at the general meeting.

March 6. I wrote, withdrawing request for perusal of "opinion," and requesting to know the reason why the Board had recommended the shareholders not to declare the statutory dividend on the new shares.

March 14. Letter from Secretaries. My letter shall be laid before Board at their next meeting.

April 24. Not having heard further, I wrote inquiring when the Board would meet.

April 30. Letter from Secretaries. Board will meet May 3.

May 11. I wrote inquiring when I may be favoured with reply to my letter of March 6.

May 17. Letter from Secretaries. Board at their last meeting adjourned consideration of my letter.

June 28. I wrote inquiring whether Board had yet been able to resume consideration of my letter.

June 29. Letter from Secretaries. Board have not yet been able to resume consideration of my letter.

Compulsory Purchase of Gas Undertakings.

Sir,—In the list given last week of statutory companies where Parliament refused to insert a purchase clause in Bills promoted by gas companies, was included Longwood. This is quite in order; but the case is asterisked, and the foot-note states "refused by Lords; inserted by agreement in Commons." This is incorrect. There is no purchase clause in the Longwood Gas Act of 1902. What actually happened was that the Corporation opposed the Bill in the House of Lords with the object of securing purchase of the portion of the Company's undertaking which is situated within the borough of Huddersfield. Without hearing evidence thereupon, the Committee declined to insert a clause. A further petition was deposited when the Bill came before the House of Commons; but it was withdrawn upon the Company slightly reducing the capital applied for, and also reducing the standard price from 3s. 2d. to 3s. 1d. It will be seen, therefore, that, so far as the progress of the Bill through the House of Commons was concerned, the question of purchase was not raised at all.

Longwood, July 25, 1912. J. H. Brearley.

Goole Gas and Water Supply.—The Gas and Water Committee of the Goole Urban District Council have just received the annual report of the Gas and Water Engineer (Mr. John Fazakerley). In the gas revenue account there was an increased revenue of £939, and in the expenditure account an increase of £619, showing an increased transfer of £320. The gross profit is £7801, against £7480 last year; and the net profit is £1506, compared with £1159. In the Water Department, though there was a very big increase in the business done, owing to a large amount of money being spent on improvements and repairs out of revenue, the net profit has decreased from £782 in 1911 to £662 this year. The balance-sheet was unanimously adopted, the Committee being thoroughly satisfied with the year's working results.

REGISTER OF PATENTS.

Inverted Incandescent Gas-Mantles.

PAYNE, C., of Coventry.

No. 12,690; May 26, 1911.

With inverted gas-mantles as at present constructed, it is found, the patentee says, that "when the gas is turned on to give the best light a considerable waste of flame takes place between the mantle-holder and the nozzle—the flame, after entering the mantle and impinging upon the lower part of the latter, passing upwardly approximately parallel with the vertical nozzle, and having no effect on the upper part of the mantle."

To effect economy in the consumption of gas for a given candle power by eliminating the waste referred to, the patentee provides an annular deflector plate between the nozzle and the mantle-holder, and adapted to deflect the upwardly directed part of the flame laterally against the upper part of the mantle. The plate may either constitute a loose fitting or be made integrally with the mantle-holder. In the former case, the plate is of circular form, having a concentric hole in it. The diameter of the hole is such that the plate is a loose sliding fit on the nozzle, while the outside diameter is approximately equal to the inside diameter of the mantle-holder. Whether the plate is loose or made in one piece with the mantle-holder, it is supported so that there is sufficient clearance between it and the usual attachment lugs on the nozzle to enable the mantle to be readily attached to, and detached from, the latter.

Destructive Distillation of Coal—A Modification of the "Coalite" Process.

CLARKE, H., of London Wall Buildings, E.C., and CAMPBELL, J. A., of Ilford.

No. 13,125; May 31, 1911.

This invention relates more especially to apparatus in which a number of retorts are mounted in a furnace setting having heating chambers provided between the respective retorts; "such chambers being formed by two perforated walls distanced apart, and provided with projecting baffle-bricks to form extensive heating surfaces—some of the baffle-bricks serving to tie the walls together—and wherein the heating of the retorts is effected by the combustion of gas or vapour and air in combustion chambers disposed beneath the heating chambers, from which the gases pass upwardly and laterally through perforated walls into contact with the retorts, finally escaping to a central flue, whence they pass out through a chimney."

The objects aimed at are "to provide a construction whereby economy in the consumption of gas for heating the retorts is secured and wasteful outward radiation of heat from the retorts is reduced or prevented; and, generally, to provide retorts and retort-settings in which carbonization may be effected at a relatively low temperature, and in which the cost of construction is relatively small."

Fig. 1 is a sectional elevation of the retorts and retort-setting. Fig. 2 is a sectional elevation at right angles to fig. 1. Fig. 3 shows one of the walls of a heating chamber, and the corresponding combustion chamber. Fig. 4 is a sectional plan on the line X of figs. 1 and 3. Fig. 5 is a sectional plan on the line Y of fig. 1. Fig. 6 is a sectional elevation (to an enlarged scale) of one of the combustion chambers with burner and air chamber.

The illustrations show a setting in which two longitudinal series of retorts are set. One series only is shown in figs. 2, 3, 4, and 5; the other series is arranged on the opposite side of the air-flue Q, which is common to both series of retorts.

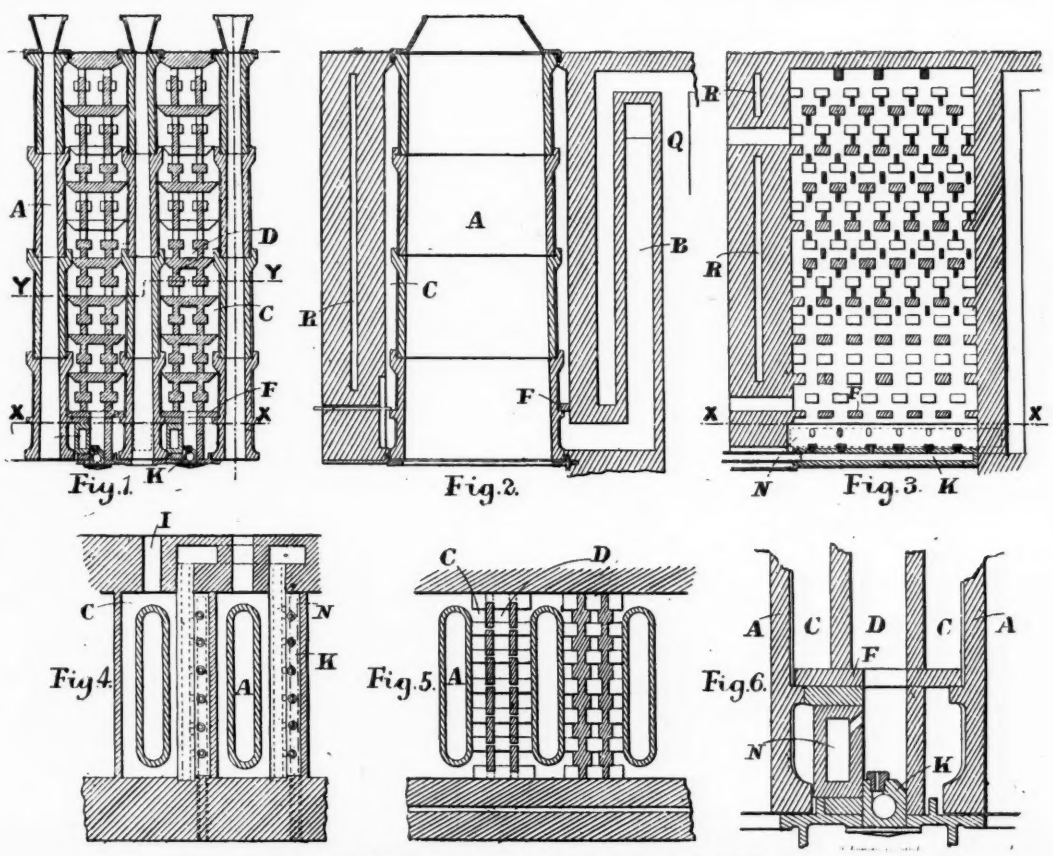
A number of vertical retorts A are provided, "of oblong cross-section and of good fire clay," and having wide lateral walls yielding narrow spaces widening slightly towards the lower extremity. A number of retorts are provided in one setting, and each retort is formed in lengths connected together by a spigot-and-socket joint. The exterior surface of the retorts is preferably corrugated to assist in strengthening them and increase the effective heating surface. Each single retort is mounted within a vertical chamber or setting C having an intervening space between the retort and the walls of the adjacent heating chambers D, down which the heating gases pass on their way to the outlet flue I. The retorts are preferably arranged in two longitudinal series with central waste-gas outlet or discharge chambers B in the setting, around which may be formed passages for preheating the air for the combustion of the heating gases.

The walls of the heating chambers are tied together at intervals by baffle-bricks, which project through and across the walls and into the retort chambers, and contact with the sides of the retorts—thereby serving to support their walls. Other projecting baffle-bricks are also provided in order to increase the heating surface of the walls of the heating-chambers.

At the lower end of each of the heating chambers is a combustion chamber, in which is fitted from below a removable gas-burner K, having removable nozzles, and retained in position by a supporting plate bolted on the frame members of the setting. At one side of the combustion chamber (immediately below the corresponding wall of the heating chamber) is an air-chamber N, having outlets leading to the combustion chamber and preferably corresponding in number to the gas-nozzles. The air is received into the chamber N from the heated air passages extending upwardly along the length of the retorts, over the centrally disposed waste-gas outlet chamber B, and downwardly to a central air supply chamber or passage Q common to both series of retorts (as in fig. 2), whence it is admitted to the heated air passages through dampers or regulating valves (not shown).

After the gas and air are ignited in the combustion chamber, the gases escape into the section of the heating chamber D, immediately above, through apertures in a slab F extending over the combustion chamber and above the air-chamber N, and resting upon a flange on the lowest section of the retort—thus forming a chamber around the lower end of the retort. The gases then pass upwardly and laterally into the retort chambers C, through apertures in the walls of the heating chamber, which apertures preferably increase in cross sectional area towards the upper end of the heating chamber.

The heating gases, after passing through the walls of the chamber D, flow downwards in contact with the lateral walls of the retorts to the outlet flues I, corresponding in number to the several combustion



Clarke and Campbell's "Destructive Distillation of Coal" Plant.

chambers or retorts—the flow of the gases being controlled by dampers in order to regulate the heating—and thence into the central waste-gas outlet or discharge chamber B leading to the chimney.

In the outer brickwork setting surrounding the retorts and heating chambers there are spaces or cavities R, or the brickwork is provided as double walls with intervening spaces to receive non-conducting material serving to minimize or reduce the outward radiation of heat from the retorts and heating chambers, and "thus materially to contribute to the economical working of the apparatus."

Gas-Fired Water-Heater with Thermostatic Control.

ROXBURGH, A. B., of Whitley Bay, and SCOTT, J. E., of Newcastle-on-Tyne.

No. 13,347; June 3, 1911.

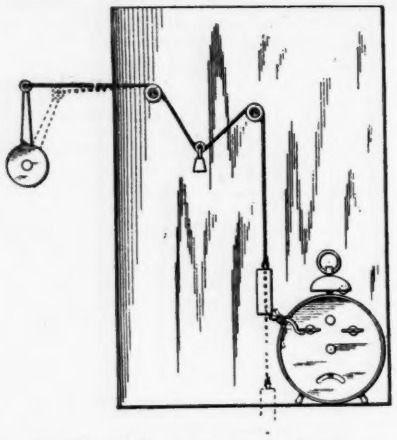
In a water-heater constructed according to this invention, the circulating or storage chamber is of considerably greater capacity than, and mainly above, the main heating chamber, which is placed immediately above the source of heat. The chambers communicate at their upper and lower parts respectively, and the provision for drawing-off heated water is where the upper means of communication between the two chambers opens into the upper one of them. Control of the passage of gaseous fuel to the apparatus is effected by a thermostat, consisting essentially of a vessel containing a liquid which expands considerably by heat (such as mercury), so disposed as to receive heat from the water in the lower part of the upper chamber.

Operating Valves and Electric Switches.

LAMKIN, A. E., and MEAD, F., of Croydon.

No. 17,809; Aug. 4, 1911.

This is an apparatus whereby the main cock of a gas-supply system (or the main switch of an electric system) may be automatically brought to the "off" position at any time to which the user sets the apparatus.



Lamkin and Mead's Gas-Valve Operator.

As shown, a trip is employed with an alarm clock whereby a weight is dropped that operates the controlling cock or switch. In one method, the finger-piece of the alarm clock winding-key (which rotates when the alarm runs down) is made to support a weight through the medium of a lever of the first order, having one arm longer than the other. The long arm can thus be placed under the finger-piece of the alarm clock and held down by it—the weight being supported on the short arm. The weight may be connected by a cord to the handle of the cock and passed over a guide pulley; and to ensure that the drop of the weight is effective, some slack is provided that may be taken up by a small weight carried by a jockey-pulley.

All that is necessary to operate the apparatus is to set the alarm to go off at the time required—the loaded lever being placed under the finger-piece of the key. As soon as the key begins to rotate (owing to the discharge of the alarm), the weight slips from the lever; and as soon as the slack has been taken up by its fall, the cock receives a sudden jerk, bringing it into the "off" position.

Obtaining Various Products from Solid Carbonaceous Materials.

ALDAMA, L. DEL M. Y., of Staines.

No. 18,659; Aug. 18, 1911.

This invention relates to a process for the fractional distillation of carbonaceous materials by heating gradatim. In the process, a pre-heated gas (substantially permanent under the conditions of the process) is employed as a carrier for the volatile matters; and the heating of the gas gradatim to a temperature equal, or substantially equal, to the temperature of the material is carried out at the point of contact, prior to bringing the gas into contact with the material.

Regarding his invention, the patentee says: It is a well-known method in the distillation of carbonaceous materials to introduce gases as heating agents into the retort wherein the carbonaceous materials are fractionated; and it has also frequently been proposed to introduce gases into the retort for the purpose of utilizing their properties as carrying media in conveying the distillation products into the condensing apparatus. Such gases are commonly made to act both as heating and as conveying or carrying agents. But it has also been proposed to introduce the gases, when used merely as carrying media, at a lower temperature than that of the materials under treatment. In order to avoid waste, the gases are frequently collected, after having yielded up their charge of distillation products, and made to re-enter the retort for the purpose of repeating their duty as heating or carrying agents.

It has been suggested in the manufacture of coal gas to employ a diluting gas at as nearly as possible the same temperature as the gas being evolved from the coal, in order to prevent the decomposition of the hydrocarbon gases in the retort and the corresponding impoverishment of the illuminating gas manufactured.

Again, in the distillation of carbonaceous materials, he says, it has been proposed to pass an inert preheated gas through the material while the material itself is in a heated condition. But so far as he is aware, no attempts are recorded whereby the temperature of both the material treated and the gaseous carrier are, during treatment by heating gradatim, kept at the same (or substantially the same) temperature in order to carry away the volatile matter, under conditions ensuring that such volatile matter is carried away from the lowest temperature at which it is given off up to the highest temperatures at which it is desired to obtain a fractional distillation without any deleterious thermal influence of the gaseous carrier upon any distillation products which it is desired to obtain at any given temperature.

It has also been proposed to preheat difficultly condensable vapours brought back into the retort from which they were produced, in order to avoid any chilling action where it was desired to split up such vapours by bringing them back—part of them disappearing in the retort.

Now, according to the present invention, the volatile matters in carbonaceous materials solid at ordinary temperatures are extracted by the diffusion or percolation through the heated material of a gaseous medium adapted to carry away the volatile matter—the medium being heated prior to its diffusion through the material to substantially the same temperature as the material itself at the point of contact of the gas and material, so that both are afterwards subjected to the same conditions within the retort.

The invention consists in the heating of the material under treatment gradatim together with the adjustment, preferably automatically, of the temperature of the gaseous carrying medium so as to make it correspond as closely as possible with that of the material treated at all stages of the distillation under conditions which ensure the advantages obtainable by distilling at the lowest temperatures consistent with the giving off of the various distillation products yielded by the given material. For this purpose the patentee finds it inadvisable to use the gas employed as a carrying medium as a heating medium which would convey the heat required for setting free the distillation products to the material under treatment.

It is obvious that the gas selected as a carrying medium may not be one which would undergo unfavourable changes or perform undesirable reaction upon the distillation products at any temperature coming into question in the process; and, accordingly, the inventor limits the choice of the carrying medium to such gases as remain substantially permanent, chemically and physically, under the conditions of the process. In practice, ordinary coal gas is found suitable for this purpose.

In carrying out the invention, it is preferred to introduce the carrying gas under pressure (or suction, or under the combined effect of pressure and suction) at the end or bottom of the receiver or retort in which the material to be treated is contained, and to provide means for causing the greatest possible diffusion of the gas within the retort, so as to make it penetrate so far as possible through the whole of the bulk of the material. The carrying gas thus will readily separate the volatilized distillation products from the materials treated, and carry such products through and away from the bulk of the materials to a condensing apparatus, where the distillation products can be separated from the gaseous carrying medium as one or more fractions, in a well-known manner.

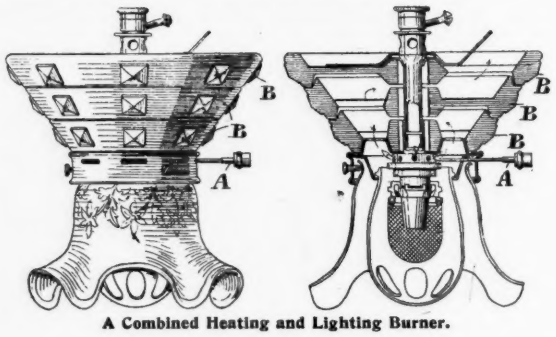
The means for adjusting the temperature of the gas may be the known arrangement in which the gas is led through a pipe passing through the material itself in the retort; and the diffusion of the gas through the material treated may be promoted by forcing in the gas at the bottom of the retort through radiating perforated pipes.

Gas Heating and Lighting Apparatus.

MENGERS, O., LANGE, K., and LENTSCHAT, G., of Berlin.

No. 25,264; Nov. 13, 1911. Convention date, Nov. 14, 1910.

This inverted gas-burner has a top constructed of a plurality of glazed conical tiles, so constructed that the hot gases cannot escape directly, but must travel along the whole internal surface of the tiles "especially of the ribs or webs." The heat of the hot gases will then be used "to the best advantage for the heating of the tiles."



A Combined Heating and Lighting Burner.

At the end of the mixing tube is a chamber, provided with openings closed by a valve operated by a lever A. The valve comprises a rotating ring having openings registering more or less with the openings in the chamber. If the valve is closed, the mantle is heated;

while it does not light if the holes are opened—the flames being used directly for heating the tiles formed in a ring. These tiles B are arranged round the mixing-tube, and the lowest rests on the bottom ring or gallery, provided with openings for the passage of the hot gases. The tiles are provided with central perforated bosses, while the part connecting the boss to the outer annular ring forms a plate or web in which are openings. The bottom and top tiles are fastened at the mixing-tube or at the bottom and top, while the intermediate tile is free to be turned. By this arrangement the openings of tiles can be adjusted one to the other, so that "for an intensive heating effect the hot gases are baffled or retained, and must go to and fro within the tiles." In consequence, "the hot gases will give up the greatest part of their heat to the tiles. By different adjustments of the openings to one another, it is possible to regulate at will the heating effect.

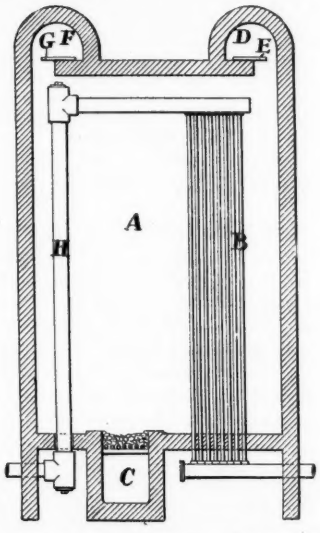
Furnace for Converting the Sulphur in Coal Gas into Sulphuretted Hydrogen.

CARPENTER, C. C., of the South Metropolitan Gas Company, Old Kent Road.

No. 6672 ; March 18, 1912.

In Evans's patent No. 29,673 of 1910 [see "JOURNAL" for Sept. 19, 1911, p. 749] there was described a process for converting the sulphur in coal gas into sulphuretted hydrogen by contact substances in externally heated iron or like containers—"the improvement consisting in preheating the gas before it enters the container." The present invention relates to a furnace particularly suitable for the process, as improved by the preheating of the gas.

As explained in the 1910 specification, the temperature to which the container is heated should be somewhat carefully adjusted ; and in an ordinary furnace, there is some difficulty in maintaining the container at the proper temperature and at the same time satisfactorily preheating the gas. In the furnace constructed according to the present invention, the heat is introduced at a position between the preheater and the container ; and the proportion of heat which passes to the one side and the other of this position is determined by flues suitably situated and controlled, "so that any desired fraction of the total heat can be caused to pass over the container by properly adjusting the draught of the corresponding flue."



Carpenter's Sulphur Conversion Furnace.

In the vertical section shown of a furnace constructed according to the invention, the chamber A contains the preheating tubes B on one side of the fire-grate C, and the container H contains the contact substance on the other side. Above the preheater is a flue D controlled by a damper E ; and there is a like flue F and damper G over the container. According as necessity arises (owing to fluctuations in the amount of gas passing) to vary the proportion of the heat which passes over the container, the dampers E and G are adjusted, so that a larger or smaller volume of the products of combustion pass from the fire-grate over the container or over the preheater.

Woodall-Duckham Vertical Retorts for Birkenhead.—Another instalment of the extensions at the Birkenhead Gas-Works formed the subject of an inquiry conducted by Mr. P. M. Crosthwaite, M.Inst.C.E., one of the Inspectors of the Local Government Board, relative to an application by the Corporation to borrow £31,421 for the modernizing of the manufacturing plant and extension of buildings. In connection with this scheme, the Corporation have accepted the tender of the Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, for the supply and erection of an installation of retorts of a capacity of 200 tons per 24 hours, subject to the Board's sanction being received for raising the money. The Gas Engineer (Mr. T. O. Paterson, M.Inst.C.E.), explained that the extension was necessary for carrying out a large scheme; and it would meet the requirements of the borough for the next twenty years. They had arrived at their maximum power with regard to the supply of gas, as in the winter the consumption in 24 hours was just about the quantity they could manufacture. By the proposed extension, the output would be increased by some 50 per cent.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills read a second time and committed : Sheffield Corporation Bill, Swansea Corporation Bill.

Bills reported : Fylde Water Board Bill, Gas Orders Confirmation Bills (Tipperary Order and Unopposed Orders), Glasgow Corporation Water Bill, Swansea Corporation Bill.

Bills read the third time and passed : Arbroath Corporation Gas Order Confirmation Bill, Ashborne Urban District Council (Gas) Bill, Birmingham Corporation Bill, Local Government Provisional Orders (Gas) Bill.

Petitions have been presented against the Sheffield Corporation Bill by electrical engineers and contractors and other ratepayers of Sheffield, and by the Rotherham Corporation.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Lords Bill reported : Bordon and District Gas Bill.

Lords Bills read the third time and passed : Arbroath Corporation Gas Order Confirmation Bill, Llanelly Rural District Water Bill.

Petitions have been presented against the Water Orders Confirmation Bill [Lords] by the Croydon Corporation and by the River Wandle Protection Association, in respect of the East Surrey Water Order. Mr. Lamb has given notice of his intention to move the rejection of the Bill at the second reading stage. In the event of this stage being successfully passed, he will move : "That it be an instruction to the Committee to delete from the East Surrey Water Order the provision allowing the undertakers to abstract by means of their pumping-stations and works at Purley and Kenley an average of 4 million gallons per day, and to provide that the total quantity of water so abstracted shall not exceed 4 million gallons in any one day of 24 hours."

The Lighting of the House.

Last Thursday, Mr. King asked the Member for St. George's-in-the-East (Mr. Wedgwood Benn) as representing the First Commissioner of Works, whether he could state what changes had recently been introduced in the lighting of the Chamber of the House ; and whether the changes made had proved satisfactory. Mr. Benn replied that two bays of the four in the ceiling light had been converted to electricity, and the First Commissioner proposed to complete the change during the recess.

BORDON AND DISTRICT GAS BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, July 23.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* FITZHERBERT WRIGHT, *Sir* PHILIP SASSOON, *and Sir* JOHN BETHELL.)

This Bill provides for the amalgamation of three existing Companies, the raising of additional capital, acquiring new lands, &c.

Mr. W. W. SZLUMPER appeared for the promoters ; and Mr. T. LANDERS represented Mr. G. F. Dalton, the only petitioner.

Mr. SZLUMPER, in opening for the Bill, stated that it was promoted by the East Hants Gas Company, Limited, and proposed the amalgamation of three existing Companies—namely, the Woolmer and District Gas Company, which is a statutory Company authorized in 1908, the Liphook Gas Company, and the Liss Gas Company, both of which are non-statutory undertakings. The opposition was very small ; the only petition, that of Mr. Dalton, being in respect of a portion of the lands scheduled in the Bill. Under (*b*) in the schedule to the Bill powers were taken to use a piece of land facing a lane leading from Greatham to Longmoor, known as the Old Sand Pit. This land was already in the possession of the limited Company, and under the Bill powers were taken to utilize it for gas purposes. The intention at present, however, was to use it only for the erection of a gasholder, although under the Bill it could be used for manufacturing purposes. With regard to this land, he explained that the Liss Company, although they had spent a considerable amount of capital in laying mains, had no gas-works of their own, and took their supply in bulk from the Bordon Company. It had been found, however, that the distance was too great to allow of sufficient pressure for the supply to the consumers. Therefore, on the advice of Mr. E. H. Stevenson, it was proposed to put a gasholder on the piece of land in question, in order to be better able to supply the district of the Liss Company. Further, a gasholder was essential at this spot, under the conditions laid down by the War Office with regard to the supply to Longmoor Camp. Mr. Dalton was the freeholder of a piece of ground immediately adjacent to this land ; and he strongly objected to the Gas Company taking it for gas purposes, as he feared depreciation of his property. He complained in his petition that an agreement had been made with the owners of other land near by—namely, Messrs. Crowley and Co.—to the effect that the land in question should not be used for manufacturing purposes except by agreement with Messrs. Crowley. Nevertheless, Mr. Dalton said he would not be satisfied with a similar clause. Apparently he wished to prevent the Company from using the land even for the erection of a gasholder.

Mr. *E. H. Stevenson* was called to prove the preamble of the Bill, and said that he would advise his clients not to manufacture gas at this spot at any time. There would not be, in his opinion, the slightest possible nuisance from a gasholder there, and although he did not suggest that it was a thing of beauty, there was no reason why any house built on the adjoining land should suffer a nuisance from it. There were very considerable possibilities in the supply to the Liss

district, where there were at present 500 consumers; and he anticipated that if the Company were properly managed, the supply would be 20 million cubic feet of gas in four or five years. A 4s. 9d. per 1000 cubic feet maximum price had been agreed with the Local Authorities. The land in dispute was the only place in the neighbourhood. It was known as the Old Sand Pit, and was at present overgrown with weeds. The holder would have a capacity of 40,000 cubic feet.

In cross-examination, witness refused to accept the view that the erection of a gasholder would be a disadvantage to the class of property which might be built near. As to danger from collapse, which was suggested by the opposing Counsel, he agreed that a gasholder had recently collapsed, but said that there had been a serious inquiry into it; and the result would be that gasholder makers would in future adopt a much larger margin of safety than in the past. The holder in question was a steel one, all above ground. He could not conceive that any of the land adjoining the piece in question would be used for good class houses. If, however, Mr. Dalton took such a serious view of the matter, he would be inclined to advise his clients to buy him out at a reasonable price.

Mr. LANDERS said that if the promoters would adopt this course, he would like an opportunity of discussing the suggestion with them.

Mr. SZLUMPER said he would undertake to buy Mr. Dalton out on reasonable terms.

Witness said that, in his opinion, there should be only one arbitrator, as the amount of land in question was not of sufficient value to stand the expense of the usual three arbitrators.

A short adjournment then took place, after which it was announced that satisfactory terms upon which arrangements would be made for buying out Mr. Dalton had been arrived at.

The preamble was then proved; and the Bill was ordered to be reported for third reading.

The Bill provides for additional capital to the extent of £12,170, with the usual one-third borrowing powers. It is not without interest to note that a clause for the protection of the London and South-Western Railway Company, containing provisions similar to those rejected last week by the same Committee in respect of the Woking Gas Bill, has been inserted in this Bill by agreement.

BOARD OF TRADE GAS ORDERS.

The Unopposed Bills Committee of the House of Lords on Tuesday sent forward for third reading the Gas Orders Confirmation (No. 2) Bill. This confirms certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Cambridge, Cleethorpes, Tipperary, and Welwyn and Knebworth.

Tipperary Order.

This Order was an opposed one, and has previously been dealt with by a Committee of the House of Lords presided over by Viscount Falkland [see "JOURNAL," last week, p. 274]. No amendments were made in the remaining Orders.

Cambridge Order.

This Order extends the limits of supply of the Cambridge University and Town Gaslight Company, and also makes provision with regard to the disposal of stock and deposits held under the Company's co-partnership scheme.

Cleethorpes Order.

The Cleethorpes Order empowers the Cleethorpes Gas Company to extend their limits of supply to include the parish of Humberstone, and to raise additional capital to the extent of £80,000 by the issue of new ordinary stock, as well as one-third borrowing powers. The price of gas in the new area is not to exceed 6d. per 1000 feet more than the price charged within the existing limits. The "Metropolitan" argand No. 2 burner is specified in the Order, in addition to a number of other provisions from the Model Bill, such as pressure, &c.

Welwyn and Knebworth Order.

The Welwyn and Knebworth Order (a Board of Trade report upon which was published last week) empowers the Welwyn, Knebworth, and District Gas Company (at present a non-statutory concern) to maintain, continue, and construct gas-works, and to manufacture and supply gas in the Welwyn district of Hertfordshire. Additional capital may be raised to the extent of £6000. The price is 4s. 4d. per 1000 cubic feet.

Paris Water Supply.—The quantity of water supplied daily to Paris last year was 80,280,000 gallons of potable water, obtained from springs or by filtering water from the Marne and Seine, and 145,800,000 gallons of raw river water for street-cleaning and industrial purposes. As the population is about 2,850,000, the average daily supply is 79 gallons per head.

Littleborough Gas Company's Continued Progress.—Mr. J. C. Hudson, presiding at the half-yearly meeting of the Littleborough Gas Company last Thursday, said the balance-sheet, the adoption of which he moved, showed that the Company were making continued progress. It was satisfactory to report an increase in the total consumption of gas for the half year, despite the loss due to the cotton strike in the early part of the period. Cooking and heating by gas were becoming increasingly popular; and the demand for cookers was very gratifying. The chief feature of the half year had been the coal strike, and the Directors were pleased to be in such a position as to maintain a regular supply of gas to meet the full requirements of their consumers during that trying period. For the six months ended June 30, the sales of gas realized £4480, compared with £4489 in the corresponding period of last year; and residual products brought in £1797, against £1526. The profit in the revenue account was £1526, and the disposable balance £3447. A dividend of 10 per cent. per annum (less income-tax) was declared. The shareholders passed a vote of thanks to the Directors and officials for their services; the speakers expressing satisfaction with the report and accounts.

LEGAL INTELLIGENCE.

A GAS COMPANY AND RIVER POLLUTION.

At Watford, last Tuesday, before a Bench of Magistrates, the Watford Gas Company were summoned by the Thames Conservancy for three offences in connection with the pollution of the River Colne. The Company pleaded guilty to one offence, on May 3, but urged extenuating circumstances. Thereupon, the Conservancy consented to the withdrawal of the summonses referring to alleged offences on May 1 and 2.

Mr. C. B. Marriott, who appeared for the Thames Conservancy, outlined the case, which, he said, had been taken up on the complaint of the President of the Friendly Angling Society, whose fishery was so seriously affected that thousands of fish were seen to be dead, dying, or sick, in the River Colne. On investigating the circumstances, it was discovered that there was a leakage of effluent from the Company's gasholder tank, that contaminated the Colne Valley Water Company's supply. When a Mr. Hampton went to the gas-works, he found two iron pipes which directly communicated with the River Colne. On May 3, the overflow from the defective tank passed through these pipes into the river, and became injurious to fish life. A sample of water taken from the Colne was sent up to the Public Analyst (Dr. Stevenson), who discovered in the water some abnormal matter, which required a very large amount of oxygen to absorb it. When living fish were put into the water sent for analysis, it was found to be highly injurious to them, and to affect them in the same way as witnesses had seen fish affected in the River Colne.

On behalf of the Gas Company, Mr. Passmore stated that before they could get down to the leakage in the tank, the Company had to pump away 450,000 gallons of water. The Engineer acted to the best of his ability under exceptionally difficult circumstances; and the Company had done all within their power the moment the leakage was discovered.

The Chairman (Mr. J. Watkins) remarked that the Gas Company had very properly admitted one of the offences with which they were charged; and the prosecution had, under the circumstances, agreed not to proceed with the other two cases. One matter was open to observation. When the regular pipes for the conveyance of liquid matter away from the gasholder were not used for this purpose, two other pipes—which were not brought to the notice of the Thames Conservancy when they were trying to find out the cause of the contamination—were used, and conveyed the contaminated matter into the River Colne. It was a serious thing to have poisoned so many fish in the River Colne. The Magistrates felt that the full penalty of £20 should be imposed, together with £30 to cover costs.

ASSESSMENT OF WATER-WORKS FOR INCOME-TAX.

In the Court of Appeal last Tuesday, the Master of the Rolls and Lords Justices Farwell and Kennedy heard the arguments in an appeal by Mr. J. W. Hall, a Surveyor of Taxes, from a decision of Mr. Justice Hamilton. The Surveyor had assessed the water-works of the Wakefield Rural District Council at £347 10s.; and a claim for this amount (which was affirmed by the Income-Tax Commissioners) was made. The Council submitted that the amount should be £104 10s.; and their contention was upheld in the Court below, as reported in the "JOURNAL" for the 5th of March (p. 675).

Under the powers conferred by the Public Health Act, 1875, the Council in 1880 undertook the supply of water to a parish in their district. Subsequently they extended the supply, and at present there are nine parishes served. As a result of the trading, a profit for the year 1909-10 of £347 10s. was made in respect of four of the parishes; and upon this the Surveyor claimed to assess the Council. Losses, however, were made in respect of the supply to the other parishes; and the Council claimed to set off these against the profits. The Council were bound to keep separate accounts for the water supply of each contributory place; and it was contended that they could not levy a rate in any parish to meet a deficiency elsewhere, and that where in a given year a surplus was made in any parish, it had to be carried forward to meet the supply in the following year.

For the appellant, it was argued by the Solicitor-General that the whole question turned upon whether they were dealing with one or with several undertakings, and he submitted that the water-works in this case were several independent concerns, though they drew their water from one source. Mr. Ryde, K.C., for the District Council, contended, on the other hand, that as the group of persons who paid the water-rents were not necessarily the persons who paid the rates, the Income-Tax Commissioners had no right to inquire into the destination of the profits. There was, in fact, only one water undertaking, and only one profit made upon it.

Their Lordships reserved judgment.

Claim for a Superannuation Allowance.

In the King's Bench Division of the High Court of Justice last Thursday, Mr. Justice Avory had before him the action of *Webster v. Metropolitan Water Board*, which was tried without a Jury. Mr. Rowlatt, for the plaintiff, said the case raised the question of the right to a superannuation allowance under the Metropolis Water Act, 1902, in which there were the usual provisions for the transfer to the Board of the servants of the Water Companies whose undertakings were acquired, and for their superannuation. Plaintiff was a resident engineer in the service of the New River Company at the time of the transfer; and in 1909 he received three months' notice from the Board to determine his engagement. He now said he was entitled to a

superannuation allowance. He had been employed on the construction of the Staines reservoirs—a fifteen years' job; and the Board said his engagement was only a temporary one. He replied that he was never engaged specifically for this job, and that his work had not been confined to it. Mr. Justice Avory, in giving judgment, said there was no ground whatever for supposing that the Board had not contested the case in the interests of the ratepayers; but, in his opinion, they were wrong in their contention. The whole dispute had resolved itself into a question whether the plaintiff was dismissed on any other ground than misconduct within the meaning of subsection 10 of section 47 of the Act of 1902. There was nothing in the subsection limiting the right to superannuation allowance to persons who were permanently employed by the Board. He held that the plaintiff was an existing officer, or servant, of the Board who was dismissed on Dec. 6, 1909, and that, under the Act, he was entitled to a superannuation allowance. He gave judgment for a declaration in favour of the plaintiff, with payment of arrears from March 6, 1910, and costs.

A Gas Water-Heater Accident.

At the Tunbridge Wells County Court, last Tuesday, his Honour Judge Parry and a Special Jury had before them a case in which Miss Kate Juler claimed £50 damages from the Tunbridge Wells Gas Company for breach of warranty. For the plaintiff, Mr. Dodd said that Miss Juler went to the Gas Company with the idea of getting a gas-cooker, and was induced by the Secretary of the Company (Mr. C. F. Catt) to hire a gas-circulator. She was told it would be absolutely safe, and gave instructions to have it fixed. Two months later, however, the whole thing burst, all the articles in the kitchen were shattered, and Miss Juler and her companion were very much frightened. Plaintiff was claiming for damages to her goods and personal injury. Prior to the explosion, the circulator commenced playing funny tricks,—such as frequent extinction of the gas and leakage of water—but plaintiff was still assured that it was perfectly safe. Miss Juler stated that she told Mr. Catt that she would only have the circulator fixed on the assurance that it was perfectly safe, to which Mr. Catt replied that she need have no fear. Soon after the circulator had been fixed, the gas began leaking, and she complained to the Company. The foreman told her it would right itself; but subsequently, during the winter, the whole thing went off. The circulator was totally smashed. Cross-examined, she said Mr. Catt guaranteed that if she kept the gas burning there would be no frost. She did not tell a Mr. Luck that her companion lit the gas just before the accident. Her friend also denied having lit the gas at that time. For the defence, Mr. Catt stated that in a conversation with plaintiff he told her that, if used under similar conditions as the range—as it took the place of a kitchen boiler—the hot-water circulator would be perfectly safe. After the accident, he informed the plaintiff that the Company admitted no liability. Their own men did certain repairs to the house. The Company purchased the circulators and let them out on hire. They did not receive any guarantee from the manufacturers. The Company's Engineer and General Manager (Mr. A. Dougall) said that if the pipes were frozen there might be some danger if the circulator were lighted. He thought a block of ice must have prevented free circulation of the water. On behalf of the makers, evidence was given that all apparatus was tested before leaving the works. After an hour's absence, the Jury found that the circulator was fit for domestic use, and judgment was given for the defendants; an application for a new trial being refused.

Birds' Nests in Public Lamps.

In the "JOURNAL" a fortnight ago (p. 216), we reproduced from the "Co-Partnership Journal" of the South Metropolitan Gas Company some extracts from an article by Mr. W. Doig Gibb recording how one of the Company's public lamps had been found to contain the nests and eggs of titmice. Mr. Gibb remarked that the discovery raised an interesting problem in bird life; and the following facts, contained in a letter by a correspondent to "The Times" last week, may be given by way of supplement to his observations: "For several weeks past, one of the public street-lamps at Greenford, near Ealing, has been found alight every day, though the lamplighter extinguished the light each morning. Suspecting that some youthful imp with mischievous propensities was at work, the lamplighter set himself to capture the culprit who was giving him so much trouble. While waiting in hiding to pounce upon the offender, he was amazed to see the lamp apparently light itself. Investigation revealed the fact that a tomtit had built a snug nest in a corner of the lamp, and was in the habit of hopping on to the ring attached to the chain of the incandescent bye-pass—thus turning on the light."

Gas Charges at Atherton and Tyldesley.—The Atherton District Council have approved of the recommendation of the Gas and Water Committee that, from Sept. 30 next, the price of gas to consumers should be advanced from 2s. 9d. to 3s. per 1000 cubic feet, with the following discounts for prompt payment: Below 200,000 cubic feet per annum consumption, 10 per cent.; 200,000 cubic feet or more, 12½ per cent.; and for power or gassing purposes, 25 per cent. The prepayment meters are to be altered so as to give 25 cubic feet instead of 27 cubic feet of gas for 1d. The Tyldesley District Council have decided that the gas charges should be altered as under, and that the new scale should become operative during the September quarter in the case of the ordinary meters, and be applicable to the collections made on and after Sept. 1 in the case of prepayment meters: Tyldesley, 3s. 4d. per 1000 cubic feet to small consumers, subject to a discount of 5d. per 1000 cubic feet for lighting, and 8d. for cooking and power; 3s. 1d. to large consumers, subject to a discount of 5d. for lighting and 7d. for cooking and power. Astley, 3s. 9d. to small consumers, subject to a discount of 5d. for lighting, and 11d. for cooking and power; 3s. 5d. to large consumers, with a discount of 5d. for lighting and 7d. for cooking and power. Prepayment meter consumers are to have a rebate of 1d. for every 9d. collected.

MISCELLANEOUS NEWS.

A CO-PARTNERSHIP FESTIVAL.

Increasing Interest in Co-Partnership—Benefits of the System.

Fully as successful in every way as its predecessors was the annual Co-Partnership Festival in connection with the schemes of the South Metropolitan and South Suburban Gas Companies which took place at the Crystal Palace last Thursday. The guests were the Co-Partnership Committee, some of the foremen, and about 150 other employees who had been not less than ten years in the Company's service, and who held not less than £50 of stock. The wives, too, were also in all cases invited. This large gathering assembled in Lyons' Restaurant at one o'clock for dinner; and after the good things which were provided by the generosity of the Directors of the two Companies had been thoroughly enjoyed, there were a number of short but interesting speeches. Speaker after speaker drew attention to the advantages of the system, and the confident hope was expressed that its general extension to other industries would prove an effectual cure for the prevailing unhappy state of industrial unrest. To the audience, of course, the advantages of co-partnership are well known; but let us hope that the remarks made at the dinner will appeal to that large number who apparently are still in need of enlightenment on the subject. In addition, however, to the benefits of the scheme, attention was drawn by Mr. Charles Carpenter to an aspect of the matter which should—and doubtless will—be pondered over by his hearers and the other employees. As with other things, co-partnership, if it is to be successful to the fullest extent of its possibilities, must carry with it obligations in proportion to its advantages. Mr. Carpenter pointed out the rock on which some profit-sharing schemes have already split; and so it will be easy for present and future co-partners to avoid it. After the guests had risen from the tables, the services of the photographer were requisitioned, and then the remainder of the fine afternoon was spent in the grounds. Those present at the dinner included the Chairmen of the South Metropolitan and the South Suburban Companies; Mr. Frank Bush, Mr. Frank H. Jones, Mr. Laurence W. S. Rostron, Mr. W. H. Cupit, Mr. Joseph Newbold, and Mr. J. Waterer, Directors of the South Metropolitan Company (the last three being employee members of the Board); Mr. George Ross, one of the Employee Directors of the South Suburban Company; and a number of the chief officials of both Companies.

Mr. Charles Hunt, the Chairman of the South Suburban Company, presided at the dinner; and after the honouring of the Loyal Toast, he said he would ask them to honour the toast of the memory of Sir George Livesey—the founder of co-partnership in connection with the gas industry, and the founder of this feast, which was held annually in commemoration of it. As they all knew, Sir George Livesey started the system of co-partnership first with the larger of the two undertakings represented there that day, about 23 years ago; and a few years later he extended it to the smaller undertaking—the South Suburban. It was not, however, until shortly before his lamented death that the idea grew and extended to neighbouring undertakings. He (Mr. Hunt) was sure that it would have rejoiced Sir George's heart to have known of the great expansion that took place during the two or three years following his death. As those present were probably aware, a further extension of the system would shortly take place, in consequence of the two amalgamation schemes which were now before Parliament. When these came into operation, there would scarcely be a corner of this vast area of Greater London into which the light of co-partnership did not enter. They all lamented that in the year just ended both Companies sustained a very severe loss by the death of Mr. Robert Morton, who was almost a lifelong friend of Sir George Livesey, and who was his trusted adherent and counsellor in many of his undertakings. There could be no greater friend of co-partnership than was Mr. Morton, and no more real friend of the working man. They were also sorry—more than sorry—to know that during the past year labour troubles had occurred to a greater extent certainly than he (the Chairman) at any rate could remember in the course of a somewhat long life. They could only hope that better counsels would eventually prevail; and, as there was said to be a silver lining to every cloud, they had consolation in knowing that these serious troubles had directed public attention to co-partnership as a remedy for them, and that an influential Committee had been formed in order to consider the practicability of extending the system to other industries than their own. Of this Committee, the worthy Chairman of the South Metropolitan Company, their friend Mr. Carpenter, was one of the "inner circle," and he might be relied on to do what he could—as also all the members of the Committee—to extend this beneficent system to other industries. It was to be hoped that their efforts would be crowned with success. He would now ask them to rise in their places, and silently respond to the toast of "The Memory of Sir George Livesey."

The company honoured the toast, rising silently in their places.

Mr. Charles Carpenter said he had very great pleasure indeed in proposing what they must regard as the toast of the afternoon—namely, "Success to Co-Partnership." He did not think it would be necessary for him, at a meeting of this kind, to enlarge very greatly upon the toast, because, as co-partners and as co-partners' wives, they were all familiar with the subject. Mr. Hunt, in the course of his remarks made a few moments ago, reminded them that it was 23 years ago that Sir George Livesey first brought forward co-partnership, or, as it was then called, the bonus system. It was some five years afterwards before he was able to induce the Directors of another Company with

which he was associated to try a similar experiment to that which had been so successful in operation with the South Metropolitan Company, and that Company was the one united with them to-day—the South Suburban Company. Some years elapsed before anybody took any very great amount of notice of what was being done by these two Companies, or the remarkable example they were setting both to employers of labour and to employees in industry throughout the country; and it was only, as Mr. Hunt had reminded them, in the very last years of Sir George's life that the country—or, at any rate, the portion of it concerned with the gas industry—woke up, and appeared to realize all at once the possibilities of co-partnership. To-day there were 35 undertakings in the kingdom practising the principles of co-partnership, with which those present were all so familiar, and the benefits of which they all enjoyed. The magnitude of the scale on which these companies were working might be gathered from the fact that their capital was over 50 millions sterling. He might further say that the investments in London alone in the names of employees were approaching £700,000. (Applause.) Well, as was the case with all other things, there was room for improvement; and he wanted to take the opportunity that day of indicating one direction in which there was a possibility of improvement. He did not say that in their case there was very great improvement to be made, but there was a little; and as they were continually having entering into their service young co-partners, he desired to point out one important direction in which they must all look for the continued success of co-partnership. The particular matter to which he wished to draw attention was the one on which so many co-partnership systems failed. Nearly all the failures in the past of co-partnership systems had arisen because the employees had drawn out the bonus they were entitled to receive under the co-partnership rules. He need not remind them that the essence of co-partnership was that they should all be joined together in one common object ["Hear, hear"]; and in their own case this object was the supply of gas to a large area in South London. Now, they could not be co-partners unless they took a direct interest in the management of the undertaking, and in building up the necessary capital without which it could not work. He was glad to say the improvement made in late years was a very good one. In 1894, in the case of the South Metropolitan Company (he had not the figures for the South Suburban Company, but they were probably proportionately good), they had only 360 employees, holding £23,000 of stock—that was their aggregate in the year named. In 1901, the basis of the co-partnership was slightly modified; and the number of employees then rose to 2000, holding something like £100,000 of stock. The present number of employees was something approaching 6000; and the market value of their stock was £356,000. (Applause.) This was a large amount; and he thought they were right in marking their appreciation of it by applause. But it did not represent the full amount that had been paid by the South Metropolitan Company by way of bonus. The sum of £356,000 did exist to-day in bonus stock; but there was a quarter of a million—£250,000—which was missing somewhere. It was not in the business. A great deal of it, he knew, had been invested, and he believed invested well, in the purchase of houses, and in many cases in co-partners setting themselves up in other countries—in Canada, in Australia, and elsewhere; and some had changed hands owing to the death of the holders. But he was afraid all this would only account for a, comparatively speaking, small proportion of the missing quarter of a million. Those present appreciated the advantages of co-partnership; and he was sure there was not one of them who would desire to go back to the old conditions of service. But the only way in which they could progress was by doing as Mr. Austin (who was for many years on the Board of the Company) recommended them to do on more than one occasion—and that was, not to spend eleven pence until they had saved a shilling. Unless they followed this advice, and remembered that success could only come about if they looked upon the bonus as a provision for the future and as a little indication of their attachment to the Company, they could not expect to maintain the progress which they all desired, and which was necessary in their own interests and in those wider interests of the country at large.

The Chairman remarked that they had all listened with very great pleasure indeed to Mr. Carpenter's admirable address; and he (Mr. Hunt) wished that he could ask one of his colleagues on the South Suburban Board to address them. Unfortunately, Sir Fortescue Flannery, who was to have been present, was detained elsewhere. He could, however, claim Mr. Carpenter as a colleague, and say he had spoken both for the South Metropolitan Company and the South Suburban Company. No doubt, they would like to hear something also from other Directors of the South Metropolitan Company.

Mr. Frank Bush, on being called upon, said it afforded him the greatest possible pleasure to be with them that day—Livesey Day, when their thoughts were all turned to the founder of co-partnership. He remembered reading, "He does not die who bequeaths some influence to the land he knows." What had Sir George Livesey bequeathed to them and to the country? This fine scheme of co-partnership, which was applicable to innumerable industries—which had enabled them to become shareholders, holding stock aggregating some £350,000, which had brought sunshine and happiness into many a home, and which had secured lasting industrial peace. He remembered, in the early days of co-partnership—or of profit-sharing, as it was then called—Sir George Livesey used these words. He said: "What they wished to do was to bring about industrial peace and concord; and the Directors wanted the men to feel that their own interests were bound up with theirs. They were trying to do this, not only for themselves, but for their country. The eyes of all England had been directed to the South Metropolitan Gas Company; and they were anxious to show that it was possible for employers and employed to work well together." Now, Sir George was a man gifted with great power of penetration. They could all of them, he supposed, be wise after the event; but Sir George had the rare faculty, possessed by few, of being wise before the event. And he (the speaker) thought they could see what was passing through his mind when he used the words just quoted—as to what was likely to happen, and what had actually happened, in the industrial world, unless some steps were taken to prevent it. Many years ago, a well-known man said that things went through three stages—ridicule, controversy, and acceptance. Now, he was sure their scheme was never in the first category. They all knew how Sir George Livesey worked for it. He attended innumerable meetings, and read papers, and eventually gas companies adopted the scheme. Outside their own industry co-partnership just now was very much in the air, and was being talked about and discussed all over the country; and a Committee of influential men—happily their Chairman, Mr. Carpenter, was among the number—were endeavouring to get undertakings to adopt it. He (Mr. Bush) believed there was a great chance of success.

Mr. L. W. S. Rostron (the junior member of the South Metropolitan Board) was next asked by the Chairman for some observations, and he expressed his great pleasure at making his first, but he hoped not his last, appearance at the co-partnership festival. He said he wished to echo what had been already stated by Mr. Hunt and Mr. Bush—that there never was a time when co-partnership was more in people's minds and thoughts than at the present moment. They all knew only too well that they were passing through a period of great industrial unrest in this country; but the silver lining to the cloud, as Mr. Hunt had said, was that it had turned people's minds to co-partnership as the one and best hope of bringing about industrial peace and concord in this country. It was a fact that public men of all shades of opinion, employers in every trade, were taking far more interest in co-partnership than ever before; and he believed they had some grounds for hoping that before many years were past many more businesses in this country would be established on co-partnership principles, and many more employers and employed would be enjoying the same human and friendly relations that they did in these Companies to-day. It was a great pleasure to him—and he was sure to every one of them in both Companies—to feel that, thanks to Sir George Livesey, they did enjoy this system, they did know the real direction in which hope and progress lay for this country. They had experienced the great benefit of the establishment and maintenance of the human relations of employers and employed. Those present knew what a splendid thing co-partnership was; and it was to be most sincerely hoped that, as years went by, more and more employers in all trades would come to try it, and enjoy the blessings that the South Metropolitan and South Suburban Companies now did. (Applause.)

Next came Mr. George Ross, who, speaking as one of the Employee Directors of the South Suburban Company, said, like the remainder of those present, he was very thankful to be a co-partner. He had worked for other people, but never a co-partnership firm before; and if any were not fully alive to the great advantages of such conditions of labour, they should work for non-co-partnership firms, as he had done. They would be glad enough to get back to a co-partnership undertaking again. As to the work of the Board, all the members were treated as being equal.

An Employee Director of the South Metropolitan Company (Mr. Joseph Newbold) followed, and remarked that, as he saw things, the present state of labour unrest in this country could have been avoided by the general adoption of some co-partnership scheme, similar to their own. They could not help thinking of Sir George Livesey; and he would like to say that, so far as he knew, the Boards of the two Companies (he was better acquainted with one than with the other) were following in the footsteps of that gentleman.

A hearty vote of thanks to the Chairman and Directors for the splendid way in which they had entertained the guests that day was proposed by Mr. Beard, an employee of the South Metropolitan Company, who said that in the few remarks he had to make he wished to get away from co-partnership proper. The Committee thought, and they would all agree they thought rightly, that this occasion ought not to pass without some reference to the way in which the South Metropolitan Company had met the employees over the sick club, in connection with the National Insurance Act. He expected they were all pretty well aware that, if the National Insurance Act had passed in the form in which it was first placed before the country, there would have been no hope for the club, into which many men had been paying for a number of years. The matter was discussed by the Committee, and they came to the conclusion that the best thing that could be done was to endeavour to obtain exemption from the Act. They all worked very hard, and formed a deputation, and did their best to obtain exemption. But after some months of work, they had to go back to the Chairman and confess that they had failed. What did Mr. Carpenter do? He set himself to evolve the best plan, and after a deal of thought he concluded that the best way was to try and become an Approved Society under the Act. There were several great difficulties in the way; but, owing to the generous manner in which the Directors met them, these had been overcome, and they were now to become an Approved Society. This meant a very few years' working under the Act, and they would then be one of the best—if not the very best—sick club in England. He would like to add his appreciation of the kindly, courteous spirit in which the Chairman had met them in committee. They owed their thanks to him for having brought the club under the Act as an Approved Society. As to co-partnership proper, he would like to add one word. He had never been able to see—he wished he could—how this co-partnership system was to be applied universally. He left this to wiser heads, and believed a way would be found in time. But they did know that there were many large employers of labour who could well take up the scheme, with great benefit to themselves and their employees. There was no doubt about this. They all knew very well what 23 years of co-partnership had done for them—for their pockets, minds, and characters—and surely it could do the same for any other body of men. And if they believed this—and they must all believe it—it behoved every one of them to urge the claims of co-partnership whenever they had an opportunity. Some people seemed to think co-partners were selfish; but this was not true. Co-partnership, if it did anything at all, should broaden their minds, and not make them narrower; and he was sure they all had the greatest sympathy for men outside, who were employed under worse conditions. They wanted them to be raised up; and if they all did what they could to urge the adoption of co-partnership, they would be doing their little to improve things in the country.

Mr. Carter, an employee of the South Suburban Company, remarked that he regarded it as a great privilege to attend the festival, not merely

for the purpose of partaking of the good things provided so generously for them, but to participate in the good fellowship and good feeling which prevailed at these gatherings. It was an outward and visible sign of the spirit and feeling that co-partnership was calculated to produce between Labour and Capital. It was a great pleasure to him to offer his tribute to the value and the efficiency of co-partnership as a means of bridging-over the difficulties between workers and their employers—as a means of harmonizing what were popularly supposed to be the conflicting interests of Labour and Capital. The co-partnership system not only offered to the workman a share in the profits and wealth which his labour had created, but it provided machinery for adjusting any temporary difficulties, differences, or grievances which might arise—real, true Conciliation Boards, by which any troubles might be discussed in a friendly manner. Then the two Companies who were represented there that day, in their co-partnership, went further than anything that was strictly related to a man's employment. They provided for the various vicissitudes of life—sickness, accident, and old age; and, as had been mentioned that afternoon, the National Insurance Act afforded another instance of the generosity and consideration in the matter of the welfare of the employees which were characteristic of the Boards of the two Companies. They all knew that the Insurance Act had for the first time imposed upon employers the liability of contributing towards the maintenance of their men while they were sick and unable to work. Well these two co-partnership Companies had voluntarily gone a very long way beyond the amount that was enforced upon them by law, and had guaranteed benefits far in excess of those provided by the Act Reference had been made to the efforts of the Committee of the South Metropolitan Company to obtain exemption from the operation of the Act, and to the steps that had been taken to become an Approved Society. He would like it to be understood that the South Suburban Company had co-operated with them in what was done—as he hoped they always would co-operate to obtain the best possible conditions for the two Companies. As had been remarked, the relations between the Directors and the employees of their companies were a great contrast to the hatred and bitterness that had been engendered by industrial strife elsewhere. The present tremendous unrest had set statesmen and students a problem—to find a means of preventing this turmoil; and he understood the Government had appointed a Committee to inquire into the unrest and the many proposals that had been put forward with a view to remedying this state of things. Among these suggested remedies co-partnership had taken a very prominent place; and he felt sure that it would emerge from the inquiry as the most practical means of allaying industrial unrest, by promoting a spirit of friendliness and peace between Capital and Labour. He had pleasure in seconding the vote of thanks.

The vote was supported by Mr. W. Middleton, of the South Metropolitan Company, and Mr. Wilkinson, of the South Suburban Company; the latter remarking that he hoped to see co-partnership before long introduced at the docks.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Company, said it was a pleasure to him to once more take part in this annual gathering, and to feel, more fully perhaps than ever he did before, that he was a true co-partner. This being so, possibly he might be allowed to pay a personal tribute to the memory of the late Sir George Livesey. When he looked round and saw the happy workmen, the splendid way they did their work, and the cordial relations existing between them all, he felt how completely and worthily Sir George had filled his life, and proved the truth of the saying that "no man has lived in vain who leaves two blades of grass where only one grew before." The movement in co-partnership was spreading; and he thoroughly believed that generations even yet unborn would profit by Sir George's work, and remember the great departed who had made such comfort and happiness possible. Like the employee Director of the South Suburban Company who had spoken, he (Mr. Gibb) had had experience in other parts; and, like him, he echoed the wish that he might never again be called upon to go outside a co-partnership Company.

Mr. S. Y. Shoubridge (the Chief Engineer of the South Suburban Company) remarked that he was glad to have an opportunity, on behalf of the South Suburban members, of thanking the Directors for the great hospitality that had been extended to them. He was not quite sure whether it was clear to those present that this gathering was at the personal invitation of the Directors of the two Companies, and not of the Companies themselves. Their thanks were therefore due to the Directors personally for their kindness. There had been many good speeches about co-partnership; and he would not add anything on the subject. Those in the South Suburban Company were pleased, as on previous similar occasions, to meet their friends of the South Metropolitan Company.

A few remarks were also made by Mr. F. M'Leod, the Secretary of the South Metropolitan Company, who fully endorsed everything that had been said in praise of co-partnership.

The vote was then carried by applause, and acknowledged by the Chairman.

Incandescent Gas-Burners for Working-Class Dwellings.—At the meeting of the London County Council to-day, the Housing of the Working Classes Committee will present a report in which they express the opinion that, with the view of effecting a desirable improvement in the lighting of the yards, staircases, and balconies of the Council's dwellings, inverted incandescent gas-burners should be substituted for the flat-flame burners at present in use. The total number of lamps to be converted is 1773. The introduction of a system of incandescent lighting will, the Committee are advised, effect a substantial reduction in the consumption of gas, and an annual saving will result, after allowing for the renewal of mantles and burners. They suggest that tenders for the work of conversion should be invited from selected firms; and as it is desirable that the alteration should be carried out before the approach of the winter months, they request the Council to authorize them to open the tenders during the summer recess, and accept the one most favourable. The Finance Committee have no observations to offer on the proposal.

BRENTFORD GAS COMPANY

The Half-Yearly Report and Accounts.

The Directors of the Brentford Gas Company, in their report for the six months ended the 30th of June, which will be presented at the half-yearly meeting on Friday, state that the accounts show a profit of £58,253. After providing for fixed charges, there remains a sum of £54,298, which, with the balance brought forward, makes £136,782 available for distribution. They therefore recommend the declaration of dividends at the rate of 5, 13½, and 10½ per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £191,877; from meter and stove rents, to £26,767; and from the sale of residual products, to £51,129—the total receipts being £269,816, as compared with £261,091 in the first half of 1911. The expenditure on the manufacture of gas was £135,497; on distribution, £45,501; and on management, £8809—the total expenses being £211,563, compared with £195,184 in the six months ended June 30, 1911. The balance carried to the profit and loss account is £58,253, compared with £65,907 this time last year; and the amount available for distribution is £136,782, against £124,082.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 85,931 tons of coal and 1,630,099 gallons of oil were used in the past half year in the production of 1,706,416,000 cubic feet of gas (including 639,961,000 cubic feet of carburetted water gas), of which 1,581,414,000 cubic feet were sold and 1,605,800,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 53,723 tons; breeze, 9143 tons; tar, 1,236,808 gallons; ammoniacal liquor, 30,518 butts.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts—Company's Enlarged Area.

The following is the report of the Directors of this Company for the half year ended the 30th of June, which will be presented at the ordinary general meeting on Friday.

The accounts show that, after providing for the debenture interest, and including the amount brought forward from last half year, the balance available for dividend is £42,886 3s. 7d.; and the Directors recommend payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 16s. 8d. per cent. per annum on the ordinary stock, leaving to be carried forward to the next half year £23,740 6s. 11d.

The general coal strike, with its calculated effect upon dependent industries, passed harmlessly by the Company. Without any additional purchases, more than enough coal had been stored to last, with the aid of a moderate proportion of carburetted water gas, throughout the strike period, and until deliveries were resumed about three weeks later. Deliveries were again interrupted by the London dock strike, but are now coming forward freely.

The resort to carburetted water gas, coupled with a further increase in the yield of gas per ton carbonized, reduced the tonnage of coal used, and correspondingly the quantity of residuals made. But the shrinkage from this source is more than compensated by an all-round improvement in values. The sales of gas show an increase of 1·64 per cent.

The Bill for the acquisition of the Bromley and Crays and the West Kent undertakings has passed through Parliament, and now awaits the Royal Assent. In its present form, it provides for eventual uniformity of charge throughout the combined area, the arrangements for which, while favourable to the districts affected, will, it is believed, prove beneficial to the united undertaking.

Two other provisions which have been introduced into the Bill require special mention, one of them being the substitution, at the instance of the London County Council, and by agreement with them, of a calorific value test for the existing test for illuminating power. This provision will not immediately apply to the whole of the gas supplied by the Company; one or two local authorities, representing about 18 per cent. of the total output of the united undertaking, not having yet expressed their approval of the change.

The other provision in the Bill is one to which the Directors felt it to be their duty to offer the strongest opposition. At the instance of the Alkali Manufacturers' Association, who are a powerful body of traders banded together for the advancement of their own interests, Parliament has decided to prohibit this Company, together with other gas undertakings, from purchasing or using "in any process of manufacture any materials other than those required for the making and supplying of gas by them, or for the working-up of their own residual products, or for the construction, maintenance, and repair of their gas-works, plant, and buildings, or for the maintenance or repair of gas-fittings." The object of this clause is to prevent the Company from purchasing from any neighbouring undertaking gas residuals to work up with their own; the effect being to limit competition for such residuals in favour of the alkali manufacturers. Such limitation is, according to the experience of the Directors, contrary to liberty of trading and contrary to the public interest; and they feel it to be incumbent upon them to place on record their emphatic protest against it.

A further reduction in the price of gas of 1d. per 1000 cubic feet took effect from the date of the last meter readings. This brings down the price to 2s. 3d. per 1000 cubic feet.

Rules for the formation of an approved society under the National Insurance Act have been drafted for the consideration of the Insurance Commissioners. The terms are such as to ensure to the employees of the Company the same benefits they now receive under the existing sick society, and in certain directions to extend these. The Directors have further undertaken to continue the existing sick benefits, without

cost to the employees, for the six months during which no benefits will be payable under the Act.

The accounts accompanying the report show that the total capital expenditure at the close of the half year (including a nominal amount of £202,500 added by conversion) was £785,002, or £46,361 less than the receipts, inclusive of £49,305 premium capital—£831,363 in all. Only £684 was expended on capital account in the half year. The revenue from the sale of gas was £86,373; the rental of meters and stoves produced £7776; the sale of residuals, £38,248; and the total receipts were £132,496. The following were the principal items of expenditure: Manufacture of gas (including £40,102 for coal and £12,766 for maintenance of works and plant), £61,508; distribution, £19,132; management, £5200; rents, rates, and taxes (£5564) and miscellaneous items bringing up the total to £103,162. Among these items is a sum of £1906 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £29,334; and the amount applicable for dividend, £42,886.

The statements as to working show that, under the supervision of Mr. S. Y. Shoubridge, the Engineer, 58,300 tons of coal were carbonized and 147,035 gallons of gas oil used in the half year. The quantity of gas made was 752,675,000 cubic feet (693,493,000 cubic feet of coal gas and 59,182,000 cubic feet of oil gas), of which 743,529,000 cubic feet were sold and 751,787,000 cubic feet accounted for. The residuals were: Coke, 699,600 cwt.; breeze, 14,194 yards; tar, 597,754 gallons; ammoniacal liquor, 17,380 butts—the make of sulphate of ammonia being 710 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

The report and accounts of the Tottenham and Edmonton Gas Company for the half year ended the 30th of June have been issued, and will be submitted to the proprietors on Saturday. The Directors report an increase in the sales of gas to the extent of 10·36 per cent., compared with the first half of the past year. The consumers now number 60,902; and there are 30,281 cooking and heating stoves in use. The accounts accompanying the report show that £14,665 was spent on capital account in the six months ended June 30; £4070 being for new buildings, and £6128 for new stoves. The revenue from the sale of gas was £97,789; the rental of meters, stoves, &c., and the maintenance of mantles produced £21,370; residuals brought in £28,567; and the total receipts were £147,871. The chief items of expenditure were: Manufacture, £69,761 (including £37,293 for coal and £14,894 for maintenance of works, &c.); distribution, £27,874; management, £4952. Among the miscellaneous items of expenditure is one of £1950 for co-partnership. The total expenses for the half year were £116,237; the balance carried to the profit and loss account being £31,634, compared with £26,218 this time last year. The total amount to the credit of this account is £59,969; and the Directors recommend the payment of the full statutory dividends of 7¼ per cent. per annum on the "A" stock and 5¾ per cent. per annum on the "B" stock. These will absorb £17,198, and leave £42,771 to be carried forward.

The portions of the accounts relating to the manufacturing operations of the Company show that, under the supervision of the Engineer and Manager (Mr. A. E. Broadberry, Assoc.M.Inst.C.E.), 49,507 tons of coal and 315 tons of cannel were carbonized, and 711,835 gallons of enriching oils were used, in the production of 939,875,000 cubic feet of gas, of which 896,360,000 cubic feet were sold, and 913,989,000 cubic feet accounted for. The residuals produced were: Coke, 29,883 tons; breeze, 5860 chaldrons; tar, 588,029 gallons; and ammoniacal liquor, 13,834 butts—the yield of sulphate being 458 tons 18 cwt. 21 lbs.

EPSOM ELECTRICITY UNDERTAKING.

Gas Company's Opposition to a Loan.

A Local Government Board inquiry was held at the Epsom Urban District Council offices last Tuesday, by Mr. R. H. Hooper, M.Inst. E.E., with reference to an application for sanction to borrow £4221, for the purposes of the Council's electricity undertaking, including works for the supply of electricity in the parish of Ewell. It was explained by the Electrical Engineer (Mr. A. C. Gilling) that £3721 was required for a Diesel engine and generator; the other £500 being for extensions of mains. The Inspector remarked that the proposed expenditure should effect a material saving to the undertaking. During the last two years, it had done better than previously.

In reply to Mr. A. M. Paddon, who represented the Epsom and Ewell Gas Company, Mr. Gilling said the electricity undertaking had been going on for ten years, and until the last three years it had been carried on at a loss—charges having to be made on the rates. The ordinary charge was 5½d. per unit; but arrangements were made to supply certain establishments at special rates. The public lighting was taken over by the Electricity Department as soon as possible after the undertaking came into existence. For Tantalum lamps £4 each per annum was charged. He believed (though he was not Engineer at the time) that in September, 1909, the Gas Company wrote to the Council offering to light 450 lamps of 100-candle power with inverted burners, from sunset until 1 a.m., at £2 17s. per lamp.

Subsequently, Mr. Paddon, addressing the Inspector, said the Gas Company objected to the proposals, by reason of the past history of the undertaking. It had admittedly been exceedingly unprosperous in its early years, and by reason of this fact heavy charges had fallen upon the Gas Company as ratepayers. The rateable value of the Company was £2438; and they had to contribute to the loss incurred by an undertaking which was in active opposition to them. This was a somewhat unequitable position of things. The Company objected very strongly to the extension of the electric light business to Ewell. Epsom had no power to raise money from Ewell rates; and if Epsom should lose money in Ewell, whatever was lost would have to be made good by the ratepayers of Epsom. Of the ratepayers, the Gas Company were the third largest. They objected to being contributors to any further loss that might be incurred by what they considered an extremely ill-advised extension beyond the present limits of supply. In the accounts of 1911, the amount received by the Council for private lighting was £3203, and for public lighting £2050. This seemed an extraordinary proportion to receive for public lighting, from a source absolutely under the Council's arbitrary control. It was plain that the public lighting was being retained under conditions obviously detrimental to the public interest. The public could get much better lighting if the matter were made one of commercial tendering. He submitted that, in the interest of his clients and the public, the lighting ought to be done in the best possible way, at the lowest possible price. The undertaking might be called upon to put its house in order a little more in the Epsom area before an extension was made to another district.

Councillor Ede pointed out that during the past two years the cost of the public lamps had been reduced, and it was intended to make a further reduction as time went on. He added that if they had accepted the Gas Company's tender of £2 17s. per lamp, it would have cost the parish £600 more than electricity did at that time.

REDUCTIONS IN PRICE AT WEST BROMWICH.

Considerable reductions in the price of gas in West Bromwich have been made by the Town Council, and they will take effect from the 1st of October. They are as follows: For prepayment consumers, the present scale is 25 cubic feet for 1d., or 3s. 4d. per 1000 cubic feet, less 5 per cent. discount, or 3s. 2d.; and the new scale is 28 cubic feet for 1d., or 2s. 11¾d. per 1000 cubic feet net. For gas used for motive power and manufacturing purposes other than lighting (in one building): Less than 50,000 cubic feet per quarter, present price 1s. 10d. per 1000 cubic feet, new scale 1s. 7d.; 50,000 to 200,000 cubic feet, present price 1s. 8d., new scale 1s. 7d.; 200,000 cubic feet and upwards, present price 1s. 5d., new scale 1s. 4d. Gas used for any other purposes than the foregoing in one building: Less than 25,000 cubic feet per quarter, present price 2s. 8d., new scale 2s. 6d.; 25,000 to 50,000 cubic feet, present price 2s. 6d., new scale 2s. 4d.; 50,000 to 500,000 cubic feet, present price 2s. 4d., new scale 2s. 2d. The new charges are subject to a discount of 5 per cent. for prompt payment. The reductions will benefit consumers to the extent of £2500 per annum. The Gas Committee have also agreed to put, free of charge, cooking-stoves into the houses where there are prepayment meters; and if these are a success, free cookers will be supplied to the ordinary consumers.

THE NEW LIGHTS IN HOLBORN.

A Successful Scheme of High and Low Pressure Inverted Gas Lighting.

To the local authorities enumerated in previous issues who have adopted the high-pressure or high-power low-pressure inverted burner lamp for street lighting—*i.e.*, Doncaster, Bournemouth, and Guildford—must now be added the Metropolitan Borough of Holborn, in which the Gaslight and Coke Company are just completing their contract for lighting the major portion of the principal thoroughfares with high-pressure Keith gas-lamps, with inverted burners, of 1800-candle power. The thoroughfares concerned are High Holborn and New Oxford Street, Kingsway, Southampton Row, Shaftesbury Avenue, and High Holborn crossing; the roads being lighted with 67 lamps, fixed on columns, spaced about 100 feet apart on the straight run. The height of the burner is about 20 feet above the pavement level; the 67 lamps giving an aggregate of 120,600 candles. All are subject to test under the contract. There are 28 "Nico" high-power low-pressure lamps, of 600 candles each in High Holborn and Tottenham Court Road, giving a total of 16,800 candles. They are on columns 16 feet high. In addition, there are clusters of three lamps on the rests in the roadway—two by Charing Cross Road, two by Tottenham Court Road, and two by New Oxford Street; each lamp being connected to the high-pressure main and giving 600 candles per unit, or 1800 candles for each cluster. Then there are 31 400-candle power low-pressure lamps on columns in British Museum Avenue, Charterhouse Street, and Charing Cross Road, on columns 14 feet in height. The remaining portion of British Museum Avenue, Rosebery Avenue, Guilford Street, and Russell Square are lit by 45 300-candle power low-pressure inverted lamps on columns 14 feet high (burner level), while Bedford Place and Russell Square corners, Gower Street, and Bedford Square and Montague Place corners, Broad Street, High Street, and Sardinia Street (north side) are lit by 34 180-candle power low-pressure gas-lamps. The remaining streets in the borough are lighted with 90-candle power inverted burner low-pressure lamps, to the number of 674, with a total candle power of 60,660. These lamps are fixed on standards 12 feet high to the burner level. The total illumination for the whole of the gas-lamps is about 330,000 candles.

With the completion of this contract, as far as the Gaslight and Coke Company are concerned, the thoroughfares of the borough are transformed from gloom to brightness; and from being what was known as the "worst-lighted borough in the Metropolis" Holborn has become one of the brightest—at least, that is the opinion of those who knew High Holborn and New Oxford Street with the single upright Kern burner lamps of a few weeks since. Now in appearance at night the thoroughfare is more like Victoria Street, Westminster, or Whitehall, so far as its lighting goes. The Company commenced the work on April 1, with four months to complete by Aug. 1, and now find their task practically finished.

PUBLIC LIGHTING OF THE CITY OF LONDON.

The Engineer's Annual Report.

The report of the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) on the works executed by the Public Health Department of the Corporation of London during the year 1911, contains the following information with regard to street lighting.

Gas Lighting.

The number of gas-lamps (including experimental lamps) paid for by the Public Health Department of the Corporation at the end of the year was 2648; being a decrease of 11 in the twelve months. The larger proportion of the low-pressure burners (1861) consumed 4·25 cubic feet of gas per hour; the consumption of most of the high-pressure lamps being 10, 20, and 25 cubic feet.

High-Pressure Inverted Gas Lighting.

The high-pressure gas lighting in Fleet Street has been satisfactorily maintained throughout the year. No stoppages have occurred, and only a few defective lights have been observed.

Other High-Pressure Incandescent Gas-Lamps.

There are (including experimental lighting) 113 other high-pressure "Keith" gas-lamps in the City thoroughfares, making 130 in all.

Low-Pressure Gas-Lamps.

The number of low-pressure gas-lamps at the end of the year was 2518, principally consuming 4½ cubic feet of gas per hour each; the illuminating power being 60 to 70 candles. When possible, the lamps are fixed on brackets, about 60 feet to 70 feet apart on the diagonal, at a height of about 12 feet from the pavement level to the burner; the cost of each lamp, with gas at 2s. 2d. per 1000 cubic feet, being £3 5s. 7d. per annum, including maintenance of mantles, &c., but not capital charges.

The number of defective gas-lights observed and reported upon during the year was 1973—viz., feeble lights, 1909; lights failed, 62; not alight during the night, 2. In addition, 81 defects in lanterns, burners, &c., were reported to the Gaslight and Coke Company and rectified. In accordance with the general instructions in force for many years past, the public gas-lamps were lighted whenever fog or unusual darkness occurred. This happened on 54 days during the year, and entailed an additional cost of £404 9s. 7d.

Charge for High-Pressure Lamps.

The prices paid to the Gaslight and Coke Company for high-pressure lamps, with gas at 2s. 2d. per 1000 cubic feet, during the year were as follows.

Size of Burner.		Annual Charge per Lamp.				
Ft. per Hour.	Description.	Gas at 2s. 2d.	Lighting and Cleaning.	Repairing.	Mantles, &c.	Total.
		£ s. d.	s. d.	s. d.	s. d.	£ s. d.
5 ft.	(Inverted)	2 6 7	..	..	55 0	5 1 7
10 ft. and pilot.	(Upright)	4 19 6	15 0	5 0	8 0 / Compr. / 6 0	6 13 6
2 Lt. 10 ft. and pilot.	(Inverted)	4 19 6	..	..	39 4	6 18 10
10 ft. and pilot.	,,	4 16 5	..	..	55 0	7 11 5
20 ft. and pilot.	(Upright)	9 12 8	24 0	7 4	16 0	12 0 0
25 ft. and pilot.	(Inverted)	11 15 9	..	..	66 9	15 2 6
30 ft. and pilot.	(Upright)	14 5 10	25 0	10 2	24 0 / Compr. / 17 0	18 2 0
30 ft. and pilot.	,,	..	..	..	..	17 10 0
60 ft. and pilot.	,,	28 11 8	35 0	25 4	48 0 / Compr. / 25 0	35 5 0
66⅔ ft. and pilot.	,,	31 13 9	40 0	30 0	29 6	36 13 3
100 ft. and pilot.	,,	47 10 7	40 0	30 0	44 4	53 4 11
1500 c.p.	(Central hung inverted)	..	..	..	..	16 0 0
4 ft.	(Inverted)	..	..	..	..	6 17 6

Number of lighting hours per annum, 4300.

Experimental Lighting.

The experimental lighting by gas and electricity, which was instituted in 1910 for the purpose of ascertaining the most suitable form of illuminant for City streets, was continued by the respective Companies. The following table gives particulars of the type and power of the lamps installed in the various thoroughfares in which the experiments are being made:—

Table of Experimental Lighting.

Position.	Centrally Hung with Lowering Gear.	Posts.	Brackets.	Candle Power.	Height of Light above Roadway.	Distance Apart.	Width of Roadway.
					Feet.	Feet.	Feet.
High-Pressure Gas.							
Cannon Street (between King William Street and Dowgate Hill)	7	2	..	1500	26·6	104	50
New Bridge Street	..	6	..	1500	16·10	125	80
Low-Pressure Gas.							
Poultry and eastern end of Cheapside	..	..	11	300	13·0	55	50
London Wall and Wood Street	..	..	26	90	12·0	95	25 to 40
Electric Arc Lamps.							
Cheapside (between Peel's Statue and Laurence Lane)	*10	..	..	3000	27·6	90	60
Watling Street	4	..	..	3000	27·6	†200	25
Farringdon Street	..	7	..	4000	25·6	175	100
Metallic Filament Lamps.							
Paternoster Row	..	..	9	75	12·6	86	20
Courts and Lanes South of Cheapside	..	..	11	75	12·6	Various.	20 to 25

* Alternate lamps extinguished at midnight. † Assisted by Metallic filament lamps.

During the year, the Streets Committee gave much time and consideration to the proposals submitted by the City of London Electric Lighting Company, Limited, and the Gaslight and Coke Company with respect to lighting the main thoroughfares with both high power electric and gas lamps centrally suspended, and with low-pressure inverted gas-lamps in the minor streets, in lieu of the upright burner gas-lamps in the latter thoroughfares, with the result that the Committee reported to the Court of Common Council on Nov. 30, as follows:—

> It will be in the recollection of your Honourable Court that on July 1, 1909, we submitted the report of the deputation appointed in October, 1908, to visit certain Continental cities for the purpose of inspecting the various systems of public lighting, with the following conclusions at which they arrived:—
>
> 1.—That, wherever possible, streets should be lighted by means of centrally-hung lamps with lowering gear.
>
> 2.—That open spaces should be lighted by means of lamps upon standards, fitted with lowering gear.
>
> 3.—That high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant, but where gas is impracticable, electricity with open arc and flame arc lamps should be installed.
>
> Without offering any opinion on the report, we asked that it might be printed and circulated among the members; and on Oct. 21, 1909, you authorized us to arrange for some further experimental lighting, with the result that on Feb. 17, 1910, offers of the City of London Electric Lighting Company and of the Gaslight and Coke Company to make further experiments on the lines suggested in the deputation's report, at a cost of £525 per annum and £360 per annum respectively, were accepted; and these experiments have since been in operation in Cheapside and Cannon Street by King William Street.

The present cost of lighting the streets of the City with gas is £10,099, and by electricity £10,774, making together an annual charge of £20,873.

We have since approached the Gas and Electric Lighting Companies with a view to arrangements being made for lighting the City in about equal proportions by gas and electricity, by means of centrally-hung lamps, as far as practicable; and having very carefully considered the matter, we submit a scheme and plan for lighting the streets of the City accordingly, and we recommend that the Gaslight and Coke Company and the City of London Electric Lighting Company be permitted to light the public ways in accordance with the said scheme, and we recommend that it be referred back to us with power to settle all necessary details and to arrange accordingly.

By this arrangement, an annual saving of £6830—viz., gas about £3380, and electricity about £3450—will be effected on the cost of public lighting, and an increase in illuminating power of about 600,000-candle power obtained.

In the case of the City of London Electric Lighting Company, the Corporation to have the option of purchasing the lamp standards, brackets, suspension gear, and lamps at the price of £2000 at the expiration of ten years, if it then desires to exercise such option; but in the case of the Gaslight and Coke Company, the lamp standards, brackets, suspension gear, and lamps at the expiration of ten years to become the property of the Corporation.

The streets in which centrally-hung gas-lamps will be used are:—

Arthur Street (late Arthur Street East).	Golden Lane.
Cannon Street (Eastern end).	Lower Thames Street.
Fish Street Hill.	Monument Street.
Fleet Street.	Queen Street (from Queen Victoria Street to Cheapside).

During the year the ten experimental centrally-hung flame arc lamps

installed by the Charing Cross, West End, and City Electricity Supply Company in November, 1907, were taken over by the City of London Electric Lighting Company, which Company are now maintaining the lamps.

Electric Lighting.

The lighting of most of the main thoroughfares by arc lamps was continued throughout the year. The number of the original type of "open" electric lamps in lighting at the end of the year, at a cost of £26 each, was 332, or a decrease of 2. In addition, there were 92 "Oliver" and "Excello" flame arcs and 46 metallic filament lamps in lighting during the year. These lamps were lighted on 43 days when fog or unusual darkness occurred, at a total additional cost of £330 17s. 3d. The number of defective electric lamps reported in the year was 81. For these failures, deductions were made from the accounts, which amounted to £13 2s. 7d. during the year. The number of arc lamps in use on Dec. 31 last was 403; the price of the original "open" lamps being £26 per annum, and of the "Oliver" flame arc lamps (partly experimental) £17 10s. In addition, there were 21 experimental arc lamps and 46 experimental metallic filament lamps; making a total of 470 electric lamps.

STOKE FEDERATED COUNCIL GAS SUPPLY.

Management of the Undertakings—Proposed Extension of Water-Gas Plant.

At the Meeting of the Stoke-upon-Trent Federated Council last Thursday the accounts of the Gas Department for the year ended the 31st of March last, as prepared by the Borough Treasurer (Mr. T. Thompson), were submitted. They furnished the following particulars in regard to the four undertakings belonging to the Council:—

	Burslem.	Stoke.	Fenton.	Longton.
Revenue	£28,923	£20,114	£13,715	£23,685
Expenditure	21,880	16,261	9,704	15,318
Gross profit	£7,043	£3,853	£4,011	£8,367
Do., per 1000 cubic feet of gas sold	7·70d.	6·42d.	9·42d.	12·09d.
Loan repayments and interest, do.	6·25d.	6·36d.	6·94d.	9·32d.
Net profit	1·55d.	0·31d. [loss]	2·74d.	2·87d.
Gas made per ton of coal, cubic feet	12,021	12,473	12,416	13,080
Gas sold, do.	11,007	11,500	11,357	12,230
Gas unaccounted for, p. ct.	6·76	6·61	7·72	4·72

The Gas Committee reported that they had adopted a report of a Sub-Committee, who had considered an agreement proposed by the four Gas Managers for the joint management of the several gas undertakings of the Corporation. The Council had previously submitted to them an agreement which they had declined to accept. The Sub-Committee resolved that they could not see their way to recommend the adoption of the Managers' memorandum, or to approve of an agreement being entered into by them providing for the joint control of the various works. The Sub-Committee suggested that the Manager of the Stoke works should be communicated with, with the view of obtaining more efficient results in the current twelve months.

Alderman T. MITCHELL, in moving the adoption of the minutes of the Gas Committee, said, as Chairman of the Committee, he felt particularly proud of the accounts presented for the past financial year, which, on the whole, had been the most successful one on record. There had been an addition of 498 to the number of consumers, and an increased output of 21,803,000 cubic feet of gas. Slot-meters continued in favour, and formed a considerable part of the increase; Fenton being unique—having nearly 4000 prepayment against 600 ordinary meters. Excellent carbonizing results had been maintained at the four works. Turning to the financial results of the year's working, the price charged for gas in Burslem, Fenton, and Longton was 1s. 10d per 1000 cubic feet with reduced rates for motive power and public lighting, and no meter-rents. There again they had to congratulate themselves upon the advantage of cheap gas and the justification of the policy adopted by the Council, whereby, after charging 1s. 10d. per 1000 cubic feet, there remained a net profit of £1418, £1165, and £1983 to Burslem, Fenton, and Longton respectively, after all expenses, capital charges, and loan accounts had been paid. He asserted that the Council stood pre-eminent among the municipal undertakings for cheap gas; and those who desired to analyze the accounts would find they revealed in every item careful and efficient management. Stoke, however, showed a loss of £187 on the year. The Committee had gone very carefully into the question of the management of the works. The extra price charged for gas at Stoke [3d. per 1000 cubic feet], and the unsatisfactory returns from the works, had necessitated drastic measures. The Committee were determined, if possible, to give the consumers at Stoke the same benefits as those enjoyed by the other towns; and the Manager had promised to effect such economies as would substantially reduce the cost of production. Referring to the difficulties caused by the coal strike, Alderman Mitchell said the Longton works had used to their utmost the carburetted water-gas plant, which was invaluable. In face of the advance in the price of coal for the ensuing year, which would probably increase the cost of gas from 3d to 4d. per 1000 cubic feet at each of the works, he thought the water-gas plant in operation at Longton might well be extended to the other works.

In the discussion which followed, opinions were expressed that the Council were entitled to more information in regard to the resolution of the Sub-Committee as to the management of the Stoke works. Alderman Goodwin said it was unfair that Stoke should be called upon to pay more for gas than the other districts. The Committee failed to see why gas could not be produced as cheaply at the Stoke works as at the others; but the Council might be assured that nothing was being left undone to bring them up to the highest degree. Mr. Goddard inquired why the Committee declined to accept the offer of the Managers on the question of joint management. Alderman Mitchell replied that it was thought better not to enter into any agreement. The Managers had given a verbal undertaking to consult each other. Mr. Hobson asked what was the Committee's reason for submitting an agreement in the first place. Alderman Mitchell replied that, in their opinion, joint management would help to obtain better results from one of the works. Alderman Collis asked what was the purport of the original agreement. The Town Clerk replied that the agreements were much the same, except that the original one of the Council made the Managers jointly responsible for the whole of the works. Mr. Hobson asked if there was not a clause that they should be subject to three months' notice. The Town Clerk said there was not. Mr. Leese remarked that there were other clauses which the Managers objected to. A copy of the original agreement was sent for and read by the Town Clerk. It specified that it was subject to three months' termination. After some further observations, the minutes were passed.

BOLTON CORPORATION GAS DEPARTMENT.

The Annual Accounts.

The report of the Gas and Lighting Committee of the Corporation of Bolton for the year ended the 31st of March has been issued. The accounts accompanying it show that the net revenue from the sale of 998,530,000 cubic feet of gas was £131,570; residuals produced £44,379; and the receipts were £177,641, compared with £170,744 in the preceding year. The manufacture of gas cost £83,476 (coal and cannel figuring for £54,361); distribution came to £10,513; management to £2384; the total expenditure to £115,779—leaving £61,862 to be carried to the net revenue account. For the preceding year, the expenditure was £116,251; and the balance was £54,493. After meeting annuities and interest on loans, paying the dividend on the Corporation stock, there is a net balance of £30,970, out of which the Committee have voted £20,000 in aid of the district rates, £10,000 to the credit of the depreciation and renewals fund account, and carried forward the balance of £970. The following comparative statistics of working are given by the Committee:—

	1912.	1911.
Tons of coal and cannel carbonized	94,014	95,013
Average cost per ton	11s. 6¾d.	11s. 4¼d.
Percentage of cannel used	1·17	0·88
Gas made, cubic feet	1,029,941,000	998,905,000
Do. do. per ton carbonized	10,955	10,513
Gas accounted for in cubic feet per ton carbonized	10,630	9,995
Gas unaccounted for per cent. through leakage and condensation	2·97	4·93
Maximum quantity of gas supplied in 24 hours during the year, cubic feet	5,524,000	5,220,000
Minimum quantity do. do.	1,065,000	984,000

The total capital expenditure on the 31st of March was £779,479; being at the rate of £756 per million cubic feet of gas made, £8 5s. 10d. per ton of coal carbonized, and 15s. 7d. per 1000 cubic feet of gas sold.

COST OF GAS MAKING AT COVENTRY.

An interesting statement has been prepared affording a comparison of the cost of manufacturing gas at the new works of the Coventry Corporation at Foleshill and at the old works in the city. It is in response to a question recently asked in the Council, as to whether a saving of 6d. per 1000 cubic feet of gas had been effected. The cost of manufacture includes all charges for producing gas and delivering it into the street mains. In order to make a comparison of the cost of manufacture at the new and the old works, it is necessary to take two years—one of them to be before the Foleshill works were commenced, and the other after these works were in complete running order; and the two years selected are to March 31, 1899, and 1912 respectively. In the former, the Act of 1898, authorizing the construction of the new works, was obtained, and the latter is the past financial year. Both are, therefore, as little affected as possible by the disturbing influences incident to the building of the new works. The price paid for coal has a material influence upon the cost of manufacture; and the statement shows that the average figure in 1899 was 12s. 1½d. per ton delivered in the city, while in 1912 it was 13s. 0⅜d. per ton delivered at Foleshill. To the latter figures 3d. per ton should be added for the saving in terminal dues as the result of the construction of the new works. There is, therefore, a difference of 1s. 2¼d. per ton in favour of 1899.

The average cost of manufacture for the ten years 1892 to 1902 was 18·67d. per 1000 cubic feet of gas sold. For the year 1899 it was 17·79d., and for the year 1912, 10·48d.—a saving in favour of 1912 of 7·31d. If the cost of coal had been the same in both years, this saving would have been at least 1d. per 1000 cubic feet more. Though the saving in manufacture has been so considerable, the cost of distribution has increased very much; and this is the case with almost all gas undertakings. The augmentation in the number of small consumers of gas by slot-meters and of cookers, especially of the class supplied free, has materially increased costs. The repairs, renewals, and maintenance of meters and stoves in 1912 show an increase of 1·54d. per 1000 cubic feet over 1899. Repairs and maintenance of mains and services cost more by 1·54d. per 1000 cubic feet; while salaries of accountants and clerks, stamp duty, employes' accident insurance, workmen's pensions, and capital charges are all rather higher. There are slight decreases in the expenditure on distribution, &c.; leaving a balance of increase in distribution and capital charges of 3·74d. per 1000 cubic feet of gas sold. There have been large increases in the rental of meters and stoves, &c.; but these have been almost counterbalanced by decreased revenue from gas, owing to the

reduction made in price—leaving a balance increase of receipts of only 0·10d. per 1000 cubic feet. The surplus in 1912 was 3·67d. per 1000 cubic feet more than in 1899. Deducting from this the 0·10d. increase in the receipts, there is the net surplus of 3·57d.; and adding to this the extra costs of distribution and capital charges of 3·74d. makes up the saving of 7·31d. per 1000 cubic feet effected in manufacture.

The benefits to consumers during the ten years from 1902 to 1912 have been very considerable. Reductions in price have been made of 4d. per 1000 cubic feet to ordinary consumers, and of 6d. per 1000 cubic feet to slot consumers. These reductions represent upwards of £40,000 saving to the two classes; and the Gas Committee anticipate that a further all-round reduction in price will be possible next year.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

According to the annual report of Mr. L. A. Stringer, the Town Clerk of Lyttelton (N.Z.), the revenue of the gas undertaking for the year ended the 31st of March (as shown in the profit and loss statement) was £4211, and the expenditure £3574—showing a profit of £641, equal to 13·81d. per 1000 cubic feet of gas. The quantity of coal carbonized was 995 tons; and the gas made 12,191,000 cubic feet, of which 11,147,600 cubic feet were sold. The make of gas per ton of coal was 12,251 cubic feet. The salient features in the operations of the Gas Department are furnished by the Manager (Mr. William M'Auliffe). They include the improvement of the works by a rearrangement of the exhauster plant in a dust-proof glass engine-room, the painting of the holders, roofs, and all ironwork, and improvements to the Manager's office. During the twelve months, the new bed of regenerative retorts, purchased during the previous year, was set, and is ready for work at a moment's notice. The first bed is getting very thin, and must give out shortly. This old bed has a record which must be unique. It had worked 2245 days (six years and two months) to March 31 last, whereas the average life of a bed of its class is about four years. Mr. Stringer says this may be a very good advertisement for the retort maker; but it must be admitted that such a result can only have been attained "by skilful and careful management." In the course of the year, 50 new services were put in; bringing up the total to 629, compared with 208 when the works were taken over by the Municipality. There are 48 slot-meters in use. The mains have been extended, and several new public lamps have been put up. They number 98, and there are 86 incandescents. The price of gas all round is 5s. 10d. net.

With regard to water supply, the town consumption during the year was 63,133,220 gallons, or at the rate of 43·12 gallons per day per head of the population, compared with 41·26 gallons in the preceding year. The producer-gas plant which has been introduced in connection with the pumping plant, as mentioned in the report for 1910-11, continues to give very satisfactory results; the fuel cost for the year working out at £2 13s. 6d. per million gallons of water pumped. The steam plant cost £13 7s. 11¼d. per million. During the year, the ratepayers sanctioned a loan of £5000 for pumping plant at Lyttelton, a reservoir of 200,000 gallons capacity, larger mains, and other improvements to the plant.

LONDON COUNTY COUNCIL AND METER TESTING.

Proposed Increase of Staff and Apparatus.

At the Meeting of the London County Council to-day, the Public Control Committee will present a report on the subject of the existing arrangements for testing gas-meters in the area of the Gaslight and Coke Company. The Committee have had before them a letter from the Company suggesting that the time has arrived when the Council should take into consideration the advisability of increasing the accommodation for testing meters. They point out that the number of meters in use has more than doubled in the past ten years, and now stands at about 735,000, and that the position with regard to testing accommodation is becoming acute, owing to the fact that many of the meters certified during the earlier part of that period have arrived at the age when re-testing is advisable. Moreover, in the view of the Company's technical officers, the Council's officers are unable to cope with the large amount of work at present to be dealt with; and probably a further considerable increase during the next few years will add to the difficulties. The Company add that the present position is brought about by an abnormal growth of business, and in no way reflects upon any of the officers at the meter-testing stations. The Committee have also received a letter from a firm of gas-meter manufacturers, complaining of the delay in returning meters sent to the Newington and Westminster offices, and asking the Council to consider the advisability of erecting another office or providing greater facilities at the existing stations. The Committee point out that though a large amount of overtime is being worked by the staff, it is not possible, under existing conditions, to keep pace with the influx of meters; and they think it essential that steps should be taken at once to increase the staff and provide additional testing apparatus. As indicating the increase in the volume of work, the Committee state that the number of meters tested at the Council's offices during the quarter ended the 30th of June last was 64,741, compared with 53,418 tested during the corresponding period of 1911; the fees received in the first-mentioned quarter amounting to £1946, against £1627 during the last-mentioned quarter. The Committee propose that six additional assistants to inspectors of gas-meters should be appointed at the commencing rate of pay of 30s. a week, and that six additional pairs of 5½ cubic feet standard gasholders should be installed. In connection with the provision of the additional apparatus at the Westminster office, it will be necessary to provide a lift, the cost of which is estimated at £70. The sum of £300 is provided in the capital votes for the current year in respect of the purchase of additional apparatus. But the Committee are advised that the cost of the new holders and fittings, together with that of the lift, will probably amount to about £770.

GAS-PRESSURE REGULATIONS FOR NEW YORK.

[From "Progressive Age."]

The New York State Public Service Commission for the First District have served upon the Companies furnishing gas in the borough of Manhattan an order fixing a minimum pressure of gas to be maintained by the Companies, and prescribing various restrictions upon the common variations in such pressure. The order of the Commission provides that the pressure at the consumer's end of the service-pipe should never be less than 2 inches water column. The opinion of the Commission, written by Commissioner Maltbie, as the result of an extended investigation, states that the Companies affected by the order have not attempted hitherto to maintain a minimum pressure in excess of 1½ inches at the end of the service-pipes, and that instances have been found where the pressure was less than this figure. The variations are also said to have been frequent and in many instances so excessive as to be annoying, if not actually dangerous.

The order of the Commission also deals with the matter of variations in pressure, and provides that on and after July 1, 1913, the maximum daily variation, independent of momentary and pulsating variations, shall not exceed 3 inches water column on any two consecutive days. After July 1, 1914, the daily variation is specified not to exceed 2½ inches, and after July 1, 1915, not to exceed 2 inches water column, on two consecutive days. Regulations are also prescribed as to the maximum momentary pressure variation and the maximum pulsating pressure variation after July 1, 1913.

The order was made as the result of an exhaustive investigation into gas-pressure conditions, in which the Commission were assisted by Mr. William A. Baehr, a consulting gas engineer of Chicago. Upon the basis of his report, extended hearings as to suggested pressure regulations were held—Commissioner Maltbie presiding. The taking-up of the matter by the Commission necessarily followed the decision of the Supreme Court of the United States in 1909 in the so-called 80-cent gas case involving the Consolidated Gas Company, in which the Court held to be unconstitutional the provision of Chapter 125 of the Laws of 1906 that the pressure of illuminating gas in service-mains should not be less than 1 inch nor more than 2½ inches. Since that decision, Gas Companies in New York City have been freed from all restrictions as to pressure and variation, except the statutory obligation to provide a pressure sufficient to ensure a light of 22-candle power, and the requirements of the proposals for bids or estimates for the supply of gas for public lighting under the Department of Water, Gas, and Electricity, that the pressure shall be not less that 1½ inches water column.

Since the Public Service Commission were vested with power to prescribe proper regulations as to gas service and pressure, they have been in receipt of a considerable number of complaints as to the pressure maintained within New York City and frequently as to the extent of variations therein. For the reason that the borough of Manhattan apparently contains the greatest variety of conditions, the largest number of gas consumers, the largest gas consumption, and the maximum congestion of population, it was decided to begin the investigation with it; but the Commission indicated their intention of carrying the investigation also into the other boroughs.

The order adopted by the Commission requires that the minimum pressure at the consumer's end of the service-pipe shall not fall below 2 inches water column, and that the maximum pressure shall not exceed 6 inches water column unless the consumer specially requests it. The order provides that the variation in pressure in any one day shall not exceed 2 inches water column, but recognizes that the Companies would have to make extensive alterations in their present distributing system before this requirement can be strictly enforced. "In order to furnish reasonable service," says the opinion of the Commission, "the Companies should so limit the maximum daily pressure variation that when a consumer's burners and appliances are adjusted to operate with greatest efficiency at the average pressure they will continue to operate with reasonable efficiency at any pressure supplied."

In addition to the variations in maximum and minimum daily pressure, the Commission also consider the momentary variations, which are defined as "sudden increases or decreases of pressure, practically instantaneous, and not recurring with regular periodicity or frequency, nor with the same amplitude," and also the so-called pulsating variations, which are defined as "sudden increases or decreases of short duration, practically instantaneous, and recurring with regular periodicity or frequency, and usually with approximately the same amplitude." The Commission make the determination from the evidence submitted that the extent of both of these types of variations in pressure should be limited. The momentary variations are deemed to be usually caused by valve manipulation and the like; and the order of the Commission provides that these momentary pressure variations should not exceed 8-10ths of an inch water column. The use of gas-engines is deemed to be the most common cause of pulsating variations in pressure. Mr. Baehr's investigation showed that there were many places in Manhattan where these pulsating pressure variations were so excessive as to be a source of great annoyance. The Commission declined to uphold the Companies' contention that they should not be required to correct these fluctuations, as they have no direct control over gas-engine installations, but held that there were various devices on the market which would practically eliminate all objectionable variations of this kind. The Commission held that these instantaneous pressure variations should ultimately not exceed a total range of 5-10ths of an inch water column, but that in view of the considerable amount of special work required to enable the Companies to comply with this limit, the minimum for the present should be 8-10ths.

An interesting feature of the opinion and order is the provision made as to what shall be deemed to constitute a violation. "Exceptional causes," says the opinion, "such as accidents, high winds, sudden and violent thunderstorms, and other causes over which a Company has no control, may render it impossible for the Companies to comply with every regulation every day. But such unusual things do not occur on successive days; hence it is provided that failure to meet the requirements on two successive days constitutes a violation of the order."

As a means of putting the Companies in a position to keep thoroughly

in touch with gas-pressure conditions, and so comply with the Commission's order, the Companies are required to maintain recording pressure-gauges throughout the entire territory supplied, with at least one gauge in each square mile of territory, or so near together that no consumer shall be far from a gauge. It is also provided that these gauges should be connected to separate services from which no gas is used, and that care should be taken to locate them where they will not be affected by external conditions. In addition, the Companies are required to make periodic detailed surveys covering the entire distribution system during periods of maximum load. The Commission will also conduct their own tests to determine whether the order is being obeyed, and will investigate complaints filed by consumers.

HASTINGS GAS COMPANY AND THEIR EMPLOYEES.

The Workmen's Sick Benefit and Pension Fund.

In forwarding a copy of the rules of the Workmen's Sick Benefit and Pension Fund in connection with the Hastings and St. Leonards Gas Company, Mr. C. E. Botley, the Engineer and General Manager, remarks that, in view of the fact that the National Health Insurance Act, the Old-Age Pensions Act, and the Workmen's Compensation Acts have superseded this fund, and necessitated its abandonment, it is interesting to place on record what has been done in the past by private effort to maintain the good relations between employers and employees which have prevailed in the Company for so many years.

Mr. Botley points out that a voluntary superannuation fund, supported by the Company's employees, was in existence during the period from 1889 to 1896. During the seven years, the amount received from members (and including £75 in grants by the Board of Directors, and also a small sum in interest on money on deposit) came to £696 3s. 2d. The total amount disbursed in pensions was £508 9s. 1d., and the balance of £187 14s. 1d. was distributed among the then members on the winding-up of the fund at the end of 1896. This amounted to about £2 10s. each. The number of pensioners on the fund during its life was seven, of whom three died, and four were transferred to the Company's Workmen's Sick Benefit and Pension Fund, which commenced operations on Jan. 1, 1897, and was dissolved on July 13, 1912. One of these pensioners is still alive.

On the starting of the Workmen's Sick Benefit and Pension Fund in 1897, membership was made compulsory, and its financial stability was guaranteed by the Company. During its life, there was distributed in pensions, sick benefits, &c., to workmen, the sum of £7098 1s. 2d., of which amount the Company subscribed £4690 2s. 4d., and the workmen £2407 18s. 10d. The number of pensioners that have been on the fund is 38, of whom 21 are still alive, and who have been dealt with by the Company according to their individual circumstances in each case. Men receiving 20s. a week and over in regular wages paid 4d. per week to the fund, and those in receipt of less than 20s. paid 2d.; and the benefits they were entitled to (unless special reservation were made with regard to pension, owing to the age of an employee on joining the Company's service) were set forth in the rules as follows:—

> III.—(*a*) A workman employed on the permanent staff of the Company shall be entitled, in case of sickness, to 12s. per week, if his payment is 4d. per week, or 6s. per week if his payment is 2d. per week, for the period specified under Rule IV.
>
> (*b*) Workmen employed on the regular but intermittent staff of the Company shall pay their subscriptions only during actual service, but shall be entitled to the same benefits under the Sick Fund as the permanent staff after being in the Company's employ one month, providing always that any workman claiming under this section shall not be entitled to any payment for sickness suffered when he is not in their employ, nor until four weeks after he has joined or re-joined the service, nor if he was suffering from the disease for which he claims when he so joined or re-joined.
>
> IV.—No more than three months' sick or accident pay will be paid to any member in any one year, and no payments will be allowed for less than two consecutive days' sickness.
>
> V.—No workman shall be entitled to a pension until he shall have been in the employ of the Company for ten years, either continuous or intermittent, nor until he shall have attained 60 years of age, and not then unless infirmity renders him unfit for work; but he shall be compelled to retire when he has attained the age of 65 years, unless the Company's Engineer sanctions his remaining at work. On retiring as above, he shall be entitled for the remainder of his life to the sum of 12s. per week if his subscription has been 4d. per week, or 6s. per week if his subscription has been 2d. per week. Proof of age in all cases will be required. (The qualifying period of ten years will, in the case of those subscribing members to the Gas Company's Workmen's Superannuation Fund on the books on Jan. 1, 1897, be calculated to include the time they have subscribed to that fund. The age for compulsory retirement does not apply to those men over 65 years of age who were in the employment of the Company on Jan. 1, 1897.)

Proposed Enlargement of the Birmingham Water Area.—At the meeting of the Birmingham Town Council to-day, they will be asked to consider the following recommendations of the Water Committee: That the Council should approve an arrangement for the transfer of the former parish of Quinton from the statutory water area of the South Staffordshire Water-Works Company to that of the Corporation, and for the purchase of the mains and other water-works in the parish; the Company obtaining the necessary parliamentary sanction, and the Corporation paying to the Company £2100, and also the stamp duty on the conveyance; and that the Committee should be authorized to complete arrangements for the lease to a syndicate of the Aston reservoir property for a term of 36 years, at an annual rental of £1500, subject to a rebate during building. Reports from the Finance Committee on the financial aspect of these proposals will be submitted.

BUENOS AYRES WATER SUPPLY.

Important Extension Scheme.

Important sanitary works have recently been embarked upon by the City of Buenos Ayres, whereby the water supply and drainage works, which have previously only served 12 square miles, are to be extended so as to cover an area of 75 square miles, which comprise practically the whole of the Federal district. The following particulars of the works recently appeared in the "Engineer."

As a preliminary, a Bill presented by the National Executive has received the sanction of Congress, and it is proposed to spend £3,600,000 upon the water supply; the new works comprising intake, tunnelling, filters, new pumps, a reservoir, and piping. The water supply will continue to be drawn from the River Plate, and the intake will be a shaft sunk into the bed of the river at 1 kilometre from land. The tunnel, 10 feet in diameter, will connect this shaft with the pumping-station, the capacity of which, together with that of the existing tunnel, will be 400 million gallons per day, or sufficient for 6 million consumers, at the rate of 66 gallons per head.

For raising the water to the purification establishment, centrifugal pumps, each of a size sufficient to deliver 2,600,000 gallons per hour, will be utilized. These pumps, of which six will form the initial installation—to be later increased to 24—will be driven by compound steam-engines supplied with steam from water-tube boilers fitted with superheaters. It is understood that the contract for supplying and installing the engines has been awarded to Messrs. J. Simpson and Co., Limited, of Newark-on-Trent.

It is proposed to employ triple-expansion Worthington engines for lifting the water after purification. The complete scheme provides for two reservoirs, into which the water will be pumped. But at the outset one reservoir, to be situated at Caballito, will suffice; and the contract for the manufacture and erection of this has recently been awarded to the Cleveland Bridge and Engineering Company, Limited, of Darlington. This reservoir will consist of three tiers of wrought-iron tanks supported on cast-iron quadruple columns. Each floor will be composed of four rectangular tanks with a central court affording light and ventilation—one corner being for this purpose omitted from each of the four tanks on each floor.

The four tanks on the first floor will each be 134 ft. 5 in. square and 12 ft. 9 in. deep; the tanks on the second floor, 135 ft. 6¾ in. square and 12 ft. 9 in. deep; and those on the third floor, 133 feet square and 12 ft. 9 in. deep. The total contents of the four tiers of tanks taken together will be 16 million gallons. The distance from the base of the cast-iron columns to the bottom of the inside of the first tank will be 54 ft. 10⅞ in.; while the total height of the building, measured from the base of the columns to the top of the roof ventilator, will be 113 ft. 1½ in. The tank roofing will be carried on a steel structure. It will be partly of slate and zinc and partly glazed. There will be an approximate total of 15,400 tons of cast iron and steel work comprised in this elevated reservoir, accounted for as follows: Steel work in the girders, joists, and roofing, 5000 tons; wrought-iron work in the twelve tanks complete, 4500 tons; cast-iron in the main columns with bases and caps, 4500 tons; cast-iron water-pipes, valves, and connections, 400 tons; and sundry items, 1000 tons. The reservoir will be served by three main inlet and outlet pipes; two being 3 ft. 11¼ in. diameter and the other 3 ft. 5⅜ in. diameter, all with 30-inch branches.

EPSOM CORPORATION WATER-WORKS.

Proposed Extensions.

Some time ago, the Epsom Town Council had in contemplation the acquisition of a site for the extension of the water-works; and one on the Downs, not far from Tattenham Corner, appeared to be suitable. The Consulting Water Engineer of the Corporation (Mr. W. Vaux Graham, M.Inst.C.E.) was asked to report on the whole question of the development of the works; and he complied with the request. In the first two reports, he recommended that the following works should be carried out: Service reservoir to hold 3 million gallons, £10,500; gas-engine and pump of the type of the existing one, but possibly of a somewhat larger capacity, £5000; new 15-inch main from the pumping-station to the new reservoir, with a branch to the Downs reservoir, £6188; contingencies and engineering, £3312; land for the reservoir, £2000—total, £27,000. In a report since presented, Mr. Graham says that, although he remains of the opinion that a reservoir to contain 3 million gallons would be of great advantage to the water-works, he recognizes that the majority of the Water Committee are reluctant at present to incur so large an expenditure. He has therefore modified his proposal, so as to provide a reservoir to contain a million gallons; it being so constructed as to admit of enlargement at any time. He also says that if, in accordance with the opinion of the Committee, a site for the reservoir can be obtained on the Downs instead of the one originally contemplated, the length of the new rising main will be considerably less. These alterations will reduce the estimates to the following figures: Service reservoir, £4000; pumping machinery, £5000 (unaltered estimate); pumping main, £4782; contingencies and engineering, £2118—total cost, exclusive of the cost of land, £15,900. It is considered probable that the modified scheme will be approved by the Council.

Damage to Wandsworth Bridge by the "Wandle."—On the 19th ult., the collier belonging to the Wandsworth and Putney Gas Company collided with one of the central piers of Wandsworth Bridge, and caused serious damage. At the meeting of the London County Council last Tuesday, the matter was reported upon by the Highways Committee, who recommended the sanction of an expenditure of £1000 on the necessary repairs. The Finance Committee passed the amount as chargeable to the maintenance account; and the expenditure was authorized without discussion.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.

After a hearing extending over three days before the Private Bill Commissioners, an agreement was reached on Friday in connection with the Provisional Order promoted by the Kirkcaldy District Committee of the County Council of Fife. Power was sought to transfer and vest in the County Council of Fife and their Kirkcaldy District Committee certain powers conferred on the Wemyss and District Water Trustees, and to authorize the County Council and District Committee to exercise such powers, and construct water-works and supply water out of their district, and for other purposes.

Glasgow.

Much sympathy has been roused by the publication in a Glasgow journal of an article asking why it is that in Scotland, the land of William Murdoch's nativity and of his forefathers, there is not a single really public memorial to commemorate his genius, and that at Lugar, the place of his birth, there is not even a tablet to mark the spot. Among the few memorials which exist is the bust in the Wallace Monument at Stirling, presented by the Gas Managers' Association in Scotland. Everyone associated with the gas industry will remember that Murdoch managed to light his whole house with coal gas in 1792. While engaged as an ironfounder at Old Cumnock he lit his premises with gas, giving to Cumnock the honour of being the first town in Scotland in which the illuminant was used. Among the products of his genius may be mentioned, first and foremost, the locomotive or steam carriage (automobile or motor-car), gas lighting, the oscillating cylinder, the "D" slide-valve, the rotary engine, the "sun and planet motion" or rotative engine, the oval chuck, cast-iron cement, solidified peat ornaments, isinglass from fish, coal tar dyes, &c.

At a meeting of the Gas Committee of the Glasgow Corporation, it was decided to recommend that the rate charged for gas supplied through prepayment meters should be reduced from 2s. 6d. to 2s. 5d. per 1000 cubic feet. During the past year there has been a marked increase in the number of slot meters in use in the city.

Arbroath.—In the House of Lords on Tuesday, the Arbroath Corporation Gas Order Confirmation Bill was read a third time. The chief purpose of the Order is to give the Corporation authority to reduce the candle power of the gas supplied by them from 20 to 14 candles. Advantage has also been taken to obtain additional borrowing powers to the extent of £15,000, although there is no intention of going into any immediate additional capital expenditure.

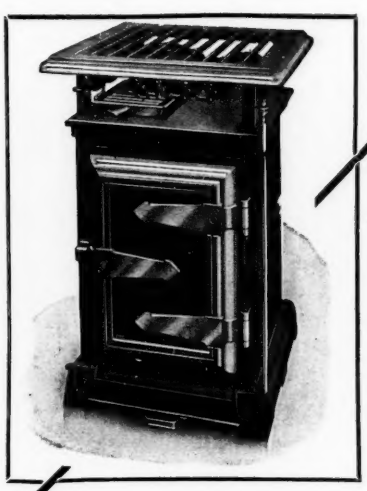
Bo'ness.—The annual general meeting of shareholders of the Bo'ness Gaslight Company, Limited, was held on Monday — ex-Provost Ballantine, the Chairman of the Company, presiding. The report of the Directors showed that the receipts for the year ended May 31 amounted to £4915, and the expenditure, including allowance for depreciation, to £4160; leaving a balance of profit for the year of £755. Adding a sum brought forward from last year of £934, gave for disposal a total of £1689, against £1640 the previous year. The Directors recommended a dividend of 6 per cent., free of income-tax; being an increase of 1 per cent. This would absorb £847, and leave a balance of £841 to be carried forward to the credit of next account. The amount of gas made during the year was 28,575,000 cubic feet; the quantity of coal used being 2805 tons. There had been added 6 ordinary meters, 45 slot-meters, 86 cookers, and 125 gas-rings, besides a number of gas-fires, wash-boilers, &c. The report was adopted.

Huntly.—The seventh annual general meeting of the Directors of the Huntly Gas Company, Limited, was held in the Brander Library Buildings on Friday evening—Mr. James Cook, the Vice-Chairman, presiding. The report and statement of accounts showed that the profit for the year to June 30, 1912, was £548. The sum of £311 was brought forward from last year's account. This, added to the profit as above, made a total of £859. From this £140 has been written off for depreciation; leaving a balance of £719 at the credit of the profit and loss account. The Directors recommend the payment of a dividend at the rate of 10 per cent. per annum, free of income-tax (£400), carrying forward to next year's account the balance of £319, subject to the Directors' remuneration.

Irvine.—The Gas Company have reduced the price of gas by 2½d. per 1000 cubic feet, making it 2s. 11d.

Paisley.—The annual financial meeting of the Town Council was held on Thursday afternoon in the Council Chambers—Provost Muir Mackean presiding. Treasurer W. Lang, in submitting his financial statement, said that the profit in the Gas Department for the year was £5579. In addition to this sum, £2454 had been put to the depreciation fund, which now stood at £8659, after withdrawing £605 for renewals and extensions. This fund would be used, as far as necessary, to pay for an extension of storage, &c., at present being carried out at the gas-works. It was interesting to note how much more important the bye-products were than formerly. Ten years ago the gas sold fetched £45,059, and residual products £6724; last year the gas sold produced £48,319, and residual products £18,734. In view of the rise in the price of coal, and of the general expectation that it would remain permanently high, he did not propose to reduce the price of gas.

Tayport.—The sequel to an alarming affair which took place on Friday, Jan. 19 last, was heard in the Cupar Sheriff Court on Thursday, when evidence was led, before Sheriff Armour-Hannay, in two actions against the Tayport Town Council. The pursuers were Mrs. Elizabeth M'Walter, or Feathers, and her attendant, Miss Helen Stewart; and each claimed £50 in respect of loss and damage sustained by them through an escape of gas. The circumstances being identical, the evidence was held applicable to both actions. His Lordship fixed Friday, Oct. 18, for hearing parties' agents on the evidence.



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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 27.

Sulphate of Ammonia.

Although the market for this material has been quiet on the surface throughout the week, there has been a firm undertone, no doubt due to there having been some requirements for shipment this month still to be filled. The tendency has consequently been for values to harden slightly; and the closing quotations are: £14 3s. 9d. per ton f.o.b. Hull, £14 5s. per ton f.o.b. Liverpool, and £14 6s. 3d. per ton f.o.b. Leith. In the forward position, producers maintain a very firm attitude; and they are still quoting £14 10s. to £14 12s. 6d. per ton at the ports for October-March delivery, in equal monthly quantities. Second-hand sellers, however, are said to be taking orders over this period at the parity of £14 5s. to £14 7s. 6d. per ton.

Nitrate of Soda.

This market remains unchanged, and holders on spot still require 11s. per cwt. for ordinary and 11s. 1½d. for refined quality.

LONDON, *July* 29.

Tar Products.

Markets for tar products continue firm. There has been a steady demand for pitch during the past week; but owing to the high prices generally asked, few transactions are reported. Benzols maintain their price, and there is a still a regular inquiry for all grades for both prompt and forward delivery. Solvent and heavy naphthas are steady; but there is no alteration in price. There is nothing fresh to report in crude carbolic. Creosote is exceedingly firm, and further business is reported at high prices for both prompt and forward delivery.

The average values during the week were: Tar, 27s. 9d. to 31s. 9d. *ex* works. Pitch, London, 52s. to 52s. 6d.; east coast, 51s. 6d. to 52s.; west coast, Clyde 52s. to 53s. 6d., Manchester 50s. 6d. to 51s. 6d., Liverpool 51s. to 52s. Benzol, 90 per cent., naked, London, 1s.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 9½d. to 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. Crude naphtha, in bulk, London, 5d. to 5½d.; North, 4⅝d. to 5d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d. f.o.b.; North, 1s. to 1s. 1½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3d. to 3⅛d.; North, salty, 2⅞d. to 3d.; liquid, 3d. to 3⅛d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 6d. to 2s. 7d. Naphthalene, £4 10s. to £10; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The position of sulphate of ammonia is practically unchanged. Prices are certainly steadier; and although there is not very much business doing for prompt delivery, there is still a fair amount of inquiry for delivery over the latter part of this year and the first few months of next. Actual Beckton to-day is quoted at £14; outside London makes at £13 7s. 6d. to £13 10s.; Leith, £14 5s. to £14 6s. 3d.; Liverpool, £14 5s. to £14 6s. 3d.; Hull, £14 5s.; Middlesbrough, £14 5s.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a strong demand for both steam and gas coals in the north-east, though steamers are not so plentiful as could be wished. In steam coals, best Northumbrians are from 13s. 9d. per ton f.o.b., second-class 11s. 9d. to 12s., and smalls 9s. to 10s. The collieries are working well, and the output is readily taken up. In the gas coal trade, best Durhams are from 12s. 9d. to 13s. per ton f.o.b., second-class from 11s. 9d. to 12s., "Wear specials" from about 14s. The Aarhuus gas-coal contract has been settled, for some 20,000 tons of "Wear specials," at near 19s. per ton delivered there. As to the greater contracts for the Metropolitan Gas Companies, it may be said that the South Metropolitan Company have now practically completed their contracts, at prices that vary with the quality from about 11s. to 12s per ton f.o.b.; and that for the larger Company progress is also being made with the negotiation of sales. The prices all round show advances of from 2s. to 2s. 6d. per ton; and there is little doubt these figures will very much rule in other contracts. Coke is very firm. Good gas coke is quoted from 18s. per ton f.o b. in the Tyne.

Scotch Coal Trade.

With the resumption of work after the holidays, the demand for all classes of coal is firm, and prices are well maintained. On Friday, on the Glasgow Coal Exchange, the prices quoted f.o.b. Glasgow were: Ell, 12s. to 13s. 6d. (according to quality); splint, 12s. 6d. to 12s. 9d.; and steam coal, 11s. 9d. to 12s.

Gas Explosion in Paris.—A serious explosion of gas occurred last Tuesday on the Charenton Bridge in Paris, with the result that the roadway and pavement were torn up from one end of the bridge to the other. The effect is shown by a photograph in last Thursday's "Daily Graphic." It is supposed that the gas was ignited by a lighted match carelessly thrown down by a smoker.

Gas Purchase Question at Biddulph.—In reply to an inquiry from the Biddulph Urban District Council as to what price they would accept for the works, the Biddulph Gas Company wrote stating that the Directors had already named their figure—£3500—and were not prepared to accept any reduction. They would, however, be willing to consider an offer from the Council. When this letter was submitted to the Council, Mr. Cole gave notice of motion that they abandon any scheme, either for the purchase of the gas-works or for buying electricity in bulk.

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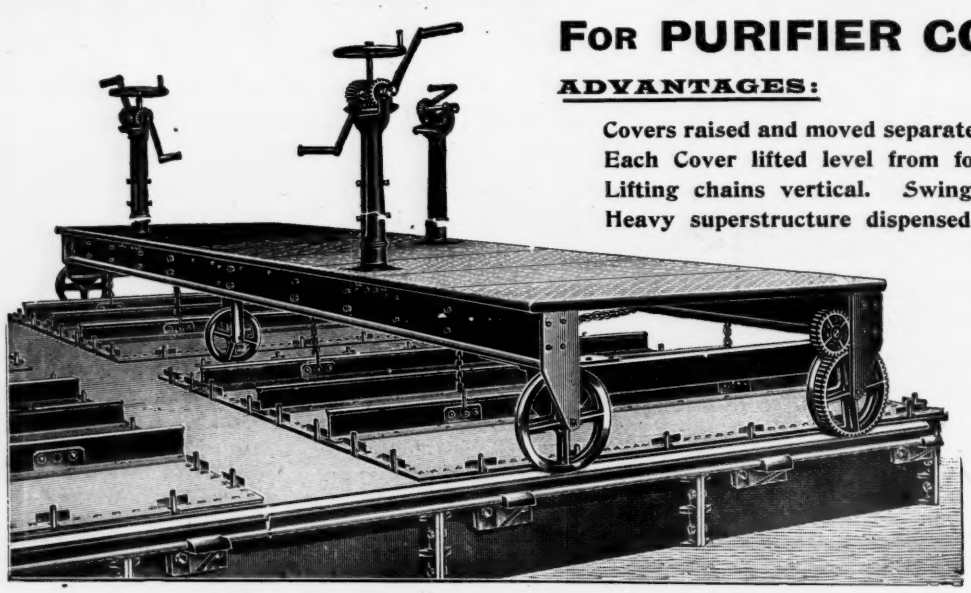

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Approaching Completion of the Chew Reservoir.

Messrs. Morrison and Mason, of Glasgow, the Contractors for the Chew Reservoir which is being constructed for the Ashton, Stalybridge, and Dukinfield (District) Joint Water Board, anticipate that within two months from now they will have finished, and the reservoir, which is the highest in the kingdom, will be filled. It was estimated to cost £110,000, including all subsidiary works. The length of the earth dam is 990 lineal feet, with 363 lineal feet of a north wing trench; and the capacity of the reservoir is about 200 million gallons. The level of the top water will be 1600 feet above Ordnance datum; and the greatest depth in the excavation of the trench is about 110 feet below the surface of the ground. With the filters at Greenfield and Swineshaw, the Joint Board will be able to deal with the whole of the water sent out for use—more than 3 million gallons per day. The cost of the filtration plant is put down at £25,000; and the outlay on the whole undertaking of the Joint Board approaches a million sterling. The area of supply is about 42 square miles. An estimated population of 160,000 has now to be catered for. There are seven impounding reservoirs with the one in the Chew Valley; and their total capacity is about 986 million gallons. Messrs. George H. Hill and Sons, of Manchester, are the Consulting Engineers for the reservoir; and Mr. F. J. Dixon, Assoc.M.Inst.C.E., is the Engineer to the Joint Board.

Gas-Meters in London County Council Schools.

At a meeting of the London County Council last Tuesday week, the Education Committee reported that they had had under consideration the question of purchasing, instead of renting, gas-meters in schools supplied with gas by the Gaslight and Coke Company. In February, 1896, when the Company abolished meter-rents, the late authority sold to the Company 496 meters for a sum of £426, on the understanding that, should they at any future time reimpose meter-rents, the Education Authority should be at liberty to purchase the meters at the same price, less a reduction, to be mutually agreed upon, in respect of the use of the meters by the Company in the meantime. The Committee have been in communication with the Company, pointing out the conditions under which the meters were originally sold, and have inquired at what price they would be prepared to transfer to the Council the whole of the meters (857) at present in use. The Company offered to sell the meters for £1000, which represents slightly over five quarters' purchase of the rentals, and an average cost of £1 3s. 4d. per meter. In submitting their offer, the Company stated that a great many of the meters had been exchanged and new ones supplied since February, 1896. The Committee were advised that the price of the meters when new would, in the aggregate, amount to approximately £5000, and that, having regard to the condition of the meters, the price asked by the Company was reasonable. The Council are at present paying in rentals £776 per annum; and it is estimated that the cost of testing and repairing the meters, for which the Council will be still liable if the purchase is effected, will be £230 a year, giving a margin of £546 a year to be set against the immediate outlay of £1000 and to provide for renewals. The Finance Committee recommended the acceptance of the Company's offer; and the Council agreed.

Doncaster Corporation Gas Department.—The abstract of the accounts of the Doncaster Corporation for the past municipal year, just issued by the Borough Accountant (Mr. C. Hanson), shows that the total income of the Gas Department for 1911-12 was £42,589, and the expenditure £34,114; leaving a profit of £8475, which is the largest made for several years. The Gas Department is the second best paying department of the Corporation.

Petersfield Water Supply.—The Petersfield Parish Council are obtaining a plentiful supply of water from their works at Oakshott Farm; the mode of delivery to the town being by gravitation. It is now proposed to construct a reservoir with a holding capacity of 95,000 gallons; and in regard to this and other extensions a Local Government Board Inspector (Mr. P. M. Crosthwaite, M.Inst.C.E.) held an inquiry last Tuesday—on the Council applying for authority to borrow £2143. There was no opposition.

Wages of Gas Workers at Smethwick.—The Smethwick Town Council have considered a memorial from the employees at the gas-works, and have decided to increase the wages as follows: Retort-house stokers and firemen, from 5s. 6d. to 5s. 9d., pipe-jumpers from 5s. 3d. to 5s. 6d., coal and coke wheelers from 5s. 1d. to 5s. 3d., per day of eight hours; purifier men, from 29s. 3d. to 30s. per week of 53 hours; engine drivers, from 5s. to 5s. 2d. per day of eight hours, with time-and-a-half for Sundays; labourers, from 22s. 6d. and 24s. to 25s. per week of 53 hours; and meter inspectors, from 32s. to 34s. per week; foremen (day and night), 2s. per week advance. Vertical retort top attendants and firemen to be paid 6s. per day, and bottom attendants 5s. 6d. per day.

New Water-Works for Troon.—The Duke of Portland has lately opened the extensive new works which have been constructed for supplying water to the burgh of Troon, the village of Prestwick, and a special county district—the whole having a population of upwards of 30,000. The principal sources of supply are Loch Bradan and Loch Lure—two natural lochs situated in the southern highlands of Ayrshire, 29 miles from Troon. In addition, five other lochs in the watershed are used as regulators of the floods. The level of Loch Bradan has been raised 8 feet; one result being to make this loch and Loch Lure a single sheet of water, at a level of 986 ft. 6 in. above the sea. The reservoir has a storage capacity of 400 million gallons. It is calculated that, after making all necessary allowances for percolation, flood waters, &c., there should be a supply of 5¼ million gallons a day. There is not storage for this quantity. But compensation water has to be deducted; and the estimate of the Engineers is that, taking this into account, there will be a net available supply of 2¼ million gallons a day, even in a succession of the driest seasons.

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Rangoon Water-Works Extensions.—It is reported that proposals have been placed before the Public Works Sub-Committee at Rangoon for the provision of a high-level reservoir to have a capacity of 20 million gallons and to cost £100,000. The proposal also involves the laying of a new main 8000 yards long, two subsidiary mains, and other extensions of the distributing system.

Rejection of an Electricity Scheme for Rugeley.—For some time past the subject of adopting electric lighting has been under the consideration of the Rugeley Urban District Council; and a scheme, estimated to cost about £4300, was prepared by Mr. Charles Balbiani, of Birmingham. It came before the ratepayers at a recent public meeting, and was severely criticized by Mr. Isaac Carr, with the result that it was almost unanimously rejected.

Water Divining near Malton.—Considerable interest was taken last Wednesday in water-divining operations carried out at Amotherby, near Malton, by Mr. John Stears, of Hessle, near Hull, whose services had been requisitioned by the Malton Rural District Council with a view to ascertaining whether sufficient water existed on a certain estate to provide the villages between Malton and Hovingham with an adequate supply of water. A Local Government Board inquiry was recently held, as a result of which the Council were directed to formulate a scheme. Having secured permission to bore at Amotherby, they decided to call in Mr. Stears, who was met by the Chairman of the Council, two engineers, and many of the members. The presence of water was indicated in various places; and boring operations will now be carried out.

The Atherton District Council have decided to apply to the Local Government Board for sanction to borrow £2000 required for laying new gas and water mains within the township.

At an inquest on a Birmingham widow, it was stated that the deceased, who had been strange in her manner, was found on the scullery floor with her head in a gas-oven, the jets of which were turned on. A verdict of "Suicide while temporarily insane" was returned.

We learn that Metropolitan Gas-Meters, Limited, of Hyson Green, Nottingham, have acquired the sole agency for gas companies and corporations in the United Kingdom of the "Strand" inverted gas-mantle. This mantle, for which many advantages are claimed, is produced by machinery patented by Mr. J. I. Robin, of Acton; and the process was described and illustrated in the "Journal" for Jan. 30 last (p. 274).

Messrs. John Terry and Co., of No. 7, Great Winchester Street, E.C., the London Agents for the Metropolitan Gas Company of Melbourne, have received a cable advice informing them that the profits of the Company for the half year to June 30 last were £109,500. A dividend of 5s. 6d. per share has been declared for the six months; the sum of £53,000 has been added to the reserve fund; and the balance of £24,000 has been carried forward. Dividends will be payable in Melbourne probably on the 29th inst., and drafts to absentee shareholders will be posted by the first mail after that date.

The Bedwellty Urban District Council have instructed Mr. R. H. Spencer, of Tredegar, to proceed with the negotiations respecting a loan of £24,000, for the completion of the purchase of the New Tredegar gas and water works.

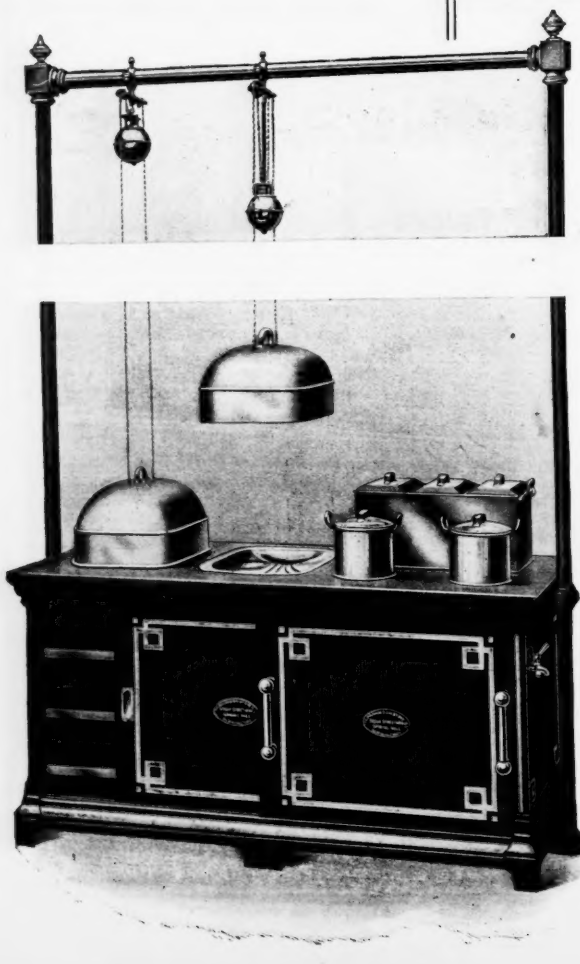
The Directors of Messrs. C. & W. Walker, Limited, have resolved to pay an interim dividend for the six months ending the 31st inst. on the ordinary shares at the rate of 10 per cent. per annum, free of income-tax, the same as a year ago.

According to the "Daily Telegraph," twice last Tuesday night the Fire Brigade were called to Leicester Square; the first time for a small fire in the building next to Daly's Theatre, and later to the same premises for the fusing of an electric wire. Five fire-engines and three escapes were on the scene.

We learn from Mr. C. Herman Senn, the Honorary Director, that the Twenty-third Universal Cookery and Food Exhibition will be held in the Royal Horticultural Hall, Westminster, from Oct. 29 to Nov. 2. These exhibitions, it is pointed out, are not commercial speculations, but are intended to be of real commercial value to the community at large. There will, as usual, be a number of competitions.

APPLICATIONS FOR LETTERS PATENT.

16,465.—Mason, G., "Luminous gas-switches." July 15.
16,471.—Dempster, R., and Sons, Ltd., and Toogood, H. J., "Vertical gas-retorts of the continuous type." July 15.
16,487.—Robin, J. I., "Bunsen burners." July 15.
16,493.—Still, C., "Distilling benzol." July 15.
16,503.—Laugey, M., "Reducing valves." July 15.
16,512.—O'Toole, E., "Utilizing waste heat of exhaust gases from engines." July 15.
16,515.—Gridley, H. J., "Water-pipes." July 15.
16,545.—Bröndum, M. V., "Automatic lighting and extinguishing." July 15.
16,546.—Reynolds, A., "Furnaces of the Siemens reversible regenerative type." July 15.
16,558.—Buckett, G. H., "Oblique pipe-joint." July 16.
16,562.—Southall, J., "Lamp-pillars." July 16.
16,626.—Ostrorog, Count S. J., "Distance gas lighting." July 16.
16,642.—Hollick, W. J., "Gas-fittings." July 17.
16,655.—Broadhead, J. W., and Dempster, R., and Sons, Ltd., "Gasholders." July 17.
16,759.—Milne, J. R., and Cowan, J., "Air and gas mixing device." July 18.
16,788.—Yates, H. J., and Davy, J. F., "Gas and coal fires." July 18.
16,800.—Hall, C. I., "Recording-mechanism for meters." July 18.
16,867.—Allen-Hoblyn, C. W. P., "Cocks." July 19.
16,931.—Hunter, J., "Joints for purifiers." July 20.



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GAS COMPANIES' STOCK AND SHARE LIST.

For the greater portion of last week—that is to say, up till about midday on Thursday—things on the Stock Exchange went steadily from bad to worse. In the Consols Market, record after record for low prices was steadily broken. Some amount of realization was in course of negotiation; and each offer seemed to knock the price lower and lower. The rot had an influence on other departments sympathetically; and Railways had to encounter this factor in addition to those of a sinister character peculiar to themselves. A turning came at last, however. In the course of Thursday, a recovery—albeit moderate—made its welcome appearance; and the leading markets participated in it, just as they had previously shared in the fall. To review the daily movements: Monday opened very dull. The gilt-edged class were gloomy, though Consols were unchanged; Rails were irregular, but mostly lower; and Americans were in a similar plight. Tuesday was a prey to pronounced weakness. Government issues were freely sold, and Consols fell $\frac{3}{8}$—touching $73\frac{5}{8}$. Rails were much depressed by liquidations and poor dividend prospects. Everything was very flat indeed on Wednesday. Consols fell another $\frac{1}{8}$. Rails and Americans were flat. Thursday was very weak at first, and Consols were done at $73\frac{1}{2}$—the record up to the present date—and Rails were further depressed by sales. Later in the day, however, there was a sharp rally. Consols touched $74\frac{1}{16}$—a rise of $\frac{7}{16}$; and Rails had a partial recovery. On Friday, the improvement in the leading departments was quite marked. Consols gained $\frac{3}{16}$, and other of the gilt-edged category advanced; while Rails were much cheered by some agreeable dividend announcements. Saturday was a calm and quiet day. Consols were firm, closing at $74\frac{3}{8}$ to $74\frac{5}{8}$—a rise of $\frac{3}{8}$ on the week. In the Money Market, there was a fair demand, though Stock Exchange requirements were light, and discount rates were harder. Business in the Gas Market was on a very fair scale; but movements were few and irregular. A pleasing feature was a smart rise in Gaslight and Coke, in response to the promise of a higher dividend. Marked prices advanced from $102\frac{7}{8}$ to 105—a gain of 2. In the secured issues, the maximum realized 82 and 84, the preference from 98 to $99\frac{3}{4}$, and the debenture from 73 to $74\frac{1}{2}$—a fall of 1. South Metropolitan was rather quiet at from 117 special to $118\frac{3}{4}$. Commercial $3\frac{1}{2}$ per cent. marked $103\frac{1}{2}$ and 105. In the Suburban and Provincial group, a notable feature was the issue of excellent accounts for the half year by the Brentford and the Tottenham and Edmonton Companies, coupled with higher rates of dividend; but the quotations were left untouched. Alliance and Dublin was done at 75, British at $44\frac{5}{8}$ and 45, and Brighton original at $218\frac{1}{2}$. In the Continental companies, Imperial showed weakness at from $181\frac{1}{2}$ down to $175\frac{1}{2}$ (a fall of 5), and European was firm at 20 *cum div.* and $19\frac{3}{8}$ *ex div.* Among the undertakings of the remoter world, Bombay changed hands at $6\frac{1}{4}$, Cape Town debenture at $75\frac{1}{4}$, Primitiva at $7\frac{5}{16}$ and $7\frac{3}{8}$, ditto preference at $5\frac{3}{8}$, San Paulo preference at from $11\frac{3}{4}$ to $12\frac{1}{16}$, and ditto debenture at $49\frac{1}{4}$.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	73—78	..	6 8 2
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
250,000	5	Apl. 12	$7\frac{1}{2}$	Bombay, Ltd.	6—$6\frac{1}{4}$	..	5 15 5
50,000	10	Feb. 29	15	Bourne-mouth Gas & Water Pref. 6 p.c.	$28\frac{3}{4}$—$29\frac{1}{4}$	..	5 1 8
332,000	10	"	7		16—$16\frac{1}{2}$	..	4 4 10
75,000	10	"	6		$14\frac{1}{2}$—$14\frac{3}{4}$	..	4 1 4
380,000	Stk.	"	$13\frac{1}{2}$†	Brentford Consolidated	258—263	..	5 2 8
330,000	"	"	$10\frac{1}{2}$†	Do. New	196—201	..	5 4 6
50,000	"	"	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	"	June 14	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,200	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	$12\frac{1}{2}$	British	$44\frac{1}{2}$—$45\frac{1}{2}$	..	5 9 11
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91—93	..	4 6 0
109,000	"	Feb. 15	6	Bromley, A 5 p.c.	130—135	..	4 8 11
165,700	"	"	$4\frac{1}{2}$	Do. B $3\frac{1}{2}$ p.c.	100—103	..	4 7 5
82,278	"	"	$5\frac{1}{2}$	Do. C 5 p.c.	119—122	..	4 10 2
55,000	"	June 28	$3\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. Deb.	78—80	..	4 7 6
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	93—95	..	4 4 3
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. $4\frac{1}{2}$ p.c. Pref.	$3\frac{1}{2}$—$4\frac{1}{2}$	..	—
100,000	Stk.	June 28	$4\frac{1}{2}$	Do. $4\frac{1}{2}$ p.c. Deb. Stk.	74—78	..	5 15 5
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
560,000	"	"	$5\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. do.	103—105	..	5 1 6
475,000	"	June 14	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	83—86	..	4 13 0
200,000	"	"	7	Do. 7 p.c. Pref.	133—135	..	5 3 8
492,270	Stk.	—	$5\frac{1}{2}$	Derby Con. Stk.	122—124	..	4 8 9
55,000	"	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	July 26	10	European, Ltd.	19—20*	..	5 0 0
16,160,600	Stk.	Feb. 15	4/17/4†	Gas-light and Coke	$101\frac{1}{4}$—$105\frac{1}{4}$	+2	4 12 7
2,600,000	"	"	$3\frac{1}{2}$		82—85	$-\frac{1}{2}$	4 2 4
4,062,235	"	"	4		98—101	..	3 19 3
4,531,705	"	June 14	3		73—75	−1	4 0 0
258,740	Stk.	Mar. 14	5	Hastings & St. L. $3\frac{1}{2}$ p.c.	93—95	..	5 5 3
82,500	"	"	$6\frac{1}{2}$	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	$16\frac{1}{2}$—17	..	6 9 5
131,000	Stk.	Mar. 14	$7\frac{1}{2}$	Ilford A and C	155—158	..	4 14 11
65,780	"	"	6	Do. B	123—125	..	4 16 0
65,500	"	June 28	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
4,940,050	Stk.	May 15	9	Imperial Continental	175—180	−5	5 0 0
1,235,000	Stk.	Feb. 15	$3\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. Deb. Red.	88—90	..	3 17 9
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219—221	..	4 10 6
718,100	"	"	7	Do. B.	157—159	..	4 8 1
306,083	"	June 28	4	Do. Deb. Stk.	99—101	..	3 19 3
75,000	5	June 14	6	Malta & Mediterranean	$4\frac{3}{8}$—$4\frac{7}{8}$	..	6 3 1
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	—	..	—
250,000	100	"	$4\frac{1}{2}$	Melbourne $4\frac{1}{2}$ p.c. Deb.	101—103	..	4 7 5
1,941,920	20	May 31	$3\frac{1}{2}$	Monte Video, Ltd.	$11\frac{1}{4}$—$11\frac{3}{4}$	..	5 19 2
1,775,892	Stk.	Feb. 15	$4\frac{1}{2}$	Newc'tle&G'tesh'd Con.	100—102	..	4 5 9
529,705	Stk.	June 28	$3\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. Deb.	85—$85\frac{1}{2}$	..	4 1 10
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	May 15	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Mar. 14	8	Ottoman, Ltd.	$7\frac{1}{4}$—$7\frac{3}{4}$	..	5 3 3
31,800	53	Feb. 29	13	Portsea Island A	—	..	—
60,000	50	"	13	Do. B	130—133	..	4 17 9
100,000	50	"	12	Do. C	127—130	..	4 12 4
398,490	5	May 15	8	Primitiva Ord.	$7\frac{1}{8}$—$7\frac{5}{8}$	..	5 8 6
796,980	5	June 28	5	Do. 5 p.c. Pref.	$5\frac{1}{4}$—$5\frac{3}{4}$	..	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
312,650	Stk.	June 28	4	River Plate 4 p.c. Deb.	93—95	..	4 4 3
275,000	5	Apl. 12	12	San Paulo, Ltd.	$13\frac{1}{2}$—$14\frac{1}{2}$	..	4 2 9
150,000	10	"	6	Do. 6 p.c. Pref.	$11\frac{3}{4}$—$12\frac{1}{4}$	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	234—236	..	4 4 9
209,984	"	"	10	Do. B	233—235	..	4 5 1
523,500	"	"	10	Do. C	233—235	..	4 5 1
90,000	10	May 31	$7\frac{1}{2}$	South African	8—9	..	8 6 8
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	117—119	..	4 11 9
1,895,445	"	July 12	3	Do. 3 p.c. Deb.	$76\frac{1}{2}$—$79\frac{1}{2}$	..	3 15 6
209,820	Stk.	Feb. 29	$8\frac{1}{2}$	South Shields Con. Stk.	157—159	..	5 6 11
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	"	"	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	"	July 12	5	Do. 5 p.c. Deb. Stk.	120—122	..	4 2 0
502,310	Stk.	May 15	5	Southampton Ord.	105—107	..	4 13 6
120,000	Stk.	Feb. 15	$7\frac{1}{2}$†	Tottenham and Edmonton A 5 p.c.	144—147	..	4 18 8
483,940	"	"	$5\frac{1}{2}$†	and B $3\frac{1}{2}$ p.c.	$116\frac{1}{2}$—$118\frac{1}{2}$	..	4 17 0
149,470	"	June 28	4	Edmonton 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	$8\frac{1}{2}$—$8\frac{3}{8}$	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 8
255,636	Stk.	"	$6\frac{7}{8}$	Wands-worth B $3\frac{1}{2}$ p.c.	141—144	..	4 15 6
85,766	"	June 28	3	3 p.c. Deb. Stk.	70—72	..	4 3 4

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